

COAL AGE

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WHETHER or not there are periods of seismic unrest which are conducive to mine explosions, there is no doubt of there being at present a period of world-wide labor unrest which is likely to cause a destructive upheaval in the international coal situation.

Belgium is struggling in the throes of a serious, although local strike. British miners and operators have split principally because of the owners' refusal to concede a minimum wage contract, and unless the government can persuade the miners to return to work pending a further discussion of the questions at issue, the mines of Great Britain will be closed indefinitely. The momentary quietude in Germany is largely due to her desire to capture the British trade, which will be thrown open to her in case of a suspension at the English collieries.

When asked the cause for such disturbed conditions, most of us point to the average advance of 27 per cent. in ten years in the price of such necessities as bread, eggs, meat, milk, etc. We are told that wages must be raised correspondingly. But a look into the question shows that district engineers and mine foremen in the anthracite field a dozen years ago, received from \$80 to \$100 per month, which compares with \$110 to \$150 paid for the same work today. At that time firebosses received \$60 to \$75; at present, several large companies pay these men as high as \$90. The anthracite miners' wages have not been advanced materially since the award of the Strike Commission in 1902. But their annual earnings today are 25 per cent. greater than they were a decade ago. Bituminous miners have profited in a like degree. It is evident, therefore, that wages all along the line have recognized the general increase in prices of common articles.

Without belittling the importance of the actual higher cost of living, we suggest that at present, most of us specify as necessities many things formerly considered luxuries. Advances in all art or science, from better transportation to phonographs and moving pictures, are educative in character. We don't so much miss what we haven't had, but once we partake of better things, it's hard to plebeianize our tastes again. Too often we forget that a 40c. slice of roast beef will put more strength in our good right arm, than a half-dozen frogs' legs at \$2 a portion. It seems that only the rich man knows that happiness and health can't be purchased at so much per pound.

There are, however, other causes than the "cost of living" to account for the present labor situation in our coal industry. Things become rusty from disuse; an arm not exercised becomes paralyzed and degeneration sets in. A few weeks ago, German imperialistic newspapers declared that only a great war would unite the people of that country, make them loyal to the throne, and save the nation from Socialism. The assertion was based on the truth that "although a faction will fight within itself, you can generally count on a united front against an enemy from without"

Less than one-fourth the miners in this country are in good standing in the Union; the leaders figure that a strike might bring a majority into the fold. They have planned for several years to better their position at this time, and contracts in all fields were made to expire simultaneously. It was hoped that the country would be in a prosperous condition so that in case of a general strike, the men could find temporary employment in other industries and the public would contribute to maintain the strike as was the case in 1902.

However, fate has ordained otherwise, and conditions are not propitious for carrying on a successful contest. The people realize that coal owners have had hard sledding for years—only in exceptional cases have operators made fair interest on their investment. It is therefore common knowledge that any wage advance must be added to the price of coal. Labor is not scarce and the men could not secure work to tide them over a suspension. A simultaneous strike therefore in both the hard-coal and the soft-coal fields seems out of the question. Support must come from within the Union, so the men in one field will be compelled to support those who are idle in the other branch of the industry.

For several years, the bituminous states have received principal attention; during each suspension, the unorganized fields (chief enemies of the union) have secured new markets, and were benefited directly by the strike. Without attempting to prophesy, it is probable therefore, that trouble this spring will occur entirely in the anthracite field. The operators are better prepared than they were ten years ago, and with general business quiet as it is today, things don't look particularly encouraging for the miners' side of the controversy.

The Trinidad District in Colorado

The different types of the crossover dumps are commonly used, among them the Phillips, the Wilson, and the Mitchell. The Hansen-Hayes tippie which is receiving such favorable consideration in the East, will undoubtedly come into use in this territory in the near future, although, so far as the writer knows, none have been installed in this district as yet.

Owing to the number of operators in the field and the consequent amount of competition, the preparation of coal for the market has become one of the fine arts.

PREPARATION OF THE COAL

The ordinary shaker, revolving and stationary screens are used. With the first named, from two to four sizes are made and loaded directly into railroad cars. Both the diamond-head bar and the perforated-plate are used, the latter having preference, as it produces a more uniformly sized coal with less dust and slack. There has been some diversity of opinion regarding the use of the square, oblong, circular or elliptical perforation for the screening plate. Each has had its adherents, but it now seems settled that the best preparation is obtained from the circular perforation and, almost without exception, all new screens are so equipped. The customary inclination given to screens of this type is 14 degrees.

The revolving type is ordinarily used to supplement the shaker or stationary screen in the preparation of slack and of the finer sizes for the washer or market. It will be found either under the tippie or up in the top of the washer. It would seem unfortunate that such conditions as heights and capacities make its use difficult on the tippie as a substitute for the present screening arrangement, as there is so little vibration connected with its operation and the resulting product is of such high quality. Both woven-wire and perforated-plate are also used, the former giving the best results. The screens in use in the district vary in size from 3 ft. 6 in. to 7 ft. in diameter and from 8 to 22 ft. long. The ordinary working pitch is about 5 degrees.

The stationary bar-screen is the natural pioneer and when properly constructed and operated, gives satisfactory results. The usual difficulty, in connection with the use of this screen is that its capacity is overcrowded. Usually an entire pit car of coal is dumped in a single mass which holds together as it slides down the bars. There is not enough obstruction in its path to turn over the lumps on the bottom, so the

By F. W. Whiteside*

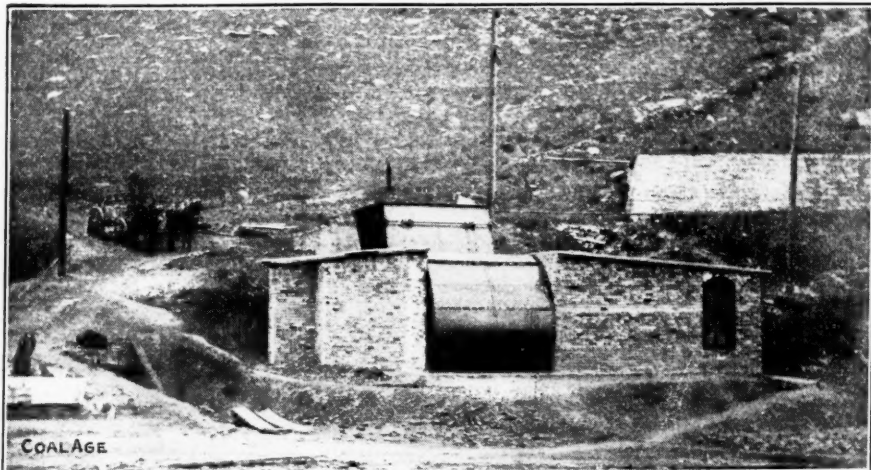
The second and concluding article on the coal operations of southern Colorado. The mining and haulage systems are described, together with some notes on a new, convertible, steel, coal- and cattle-car which is being adopted by some of the Western roads.

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slack rides down on top and is delivered with the lump coal into the car. By the use of a suitable feeding device the coal is delivered upon the screen in small quantities and ample opportunity is given the finer sizes to pass through the bars. A feeding device is also of wonderful aid in prolonging the life of the box-car loader. Many of the larger mines load mine-run and engine-lump

sight of the need of a standard height for all car floors, side doors and roofs. As a consequence a box-car loader, set for a standard height car floor is oftentimes too low to enter the side of the box- or cattle-car, on account of the excessive height of its floor. It is unsafe to raise the loader as the next car may have a low door which will not permit it to enter. It is true that there are certain makes of loaders which permit of vertical adjustment, but they are not always suitable for the loading conditions of a given mine. It seems unfortunate that a certain standard of height cannot be maintained for all coal-carrying cars.

Pit cars of both wood and steel are used. The selection of the material being dependent upon the several governing conditions about the mine. Wood cars are used more numerous than steel, probably on account of their smaller first cost and the ease with which they are repaired. One of the largest operators in the field has recently taken a new



DOUBLE-INLET SIROCCO FAN INSTALLATION AT THE HASTINGS MINE

almost exclusively for railroad use. This is particularly hard upon the box-car loader unless the product is fed into it slowly.

The bar screens in this district measure from 4 ft. 6 in. to 7 ft. in width, from 16 to 24 ft. in length and operate on a pitch of 28 to 30 degrees.

MINE AND RAILROAD CARS

In order to make a convertible car, the Western railroads are, many of them, building a steel frame drop-bottom cattle-car with side and roof doors. These cars are used for the transportation of stock, especially cattle, in the shipping seasons and for coal and coke the balance of the year. In the designing of a number of the newly constructed cars, the builders have lost

stand in this matter and placed a large order for steel cars, believing that with a long haul there will be much less leakage of coal than with the wooden car.

There is considerable diversity as regards dimensions of the cars used in this district, due to the different heights of coal, pitches of the seams and capacities of the mines. The range is from 7 to 10 ft., end to end of bumpers and from 2 ft. 6 in. to 4 ft. in height above top of the rail. Both roller-bearing and plain wheels are used, besides at least a dozen different patent wheels. All tracks have a 3-ft. gage.

RAILROAD YARDS AND SCALES

The 100-ton, 74-ft. standard track scale is most generally used for weighing empty and loaded railroad cars, while

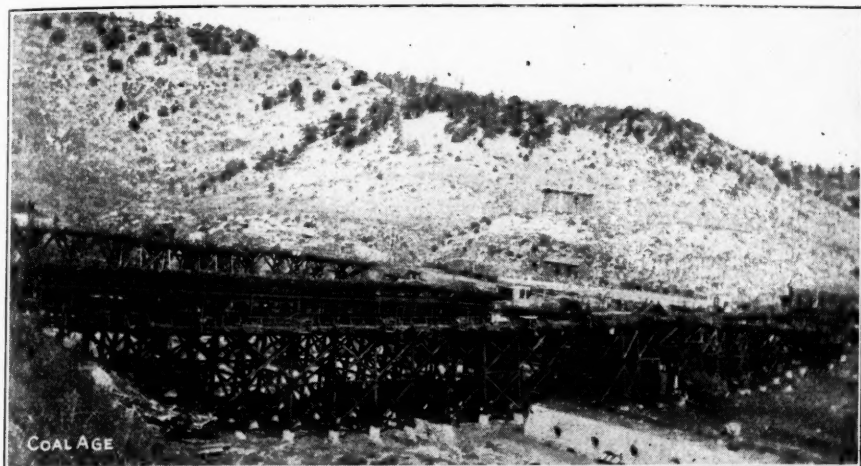
they are standing under the tippie. The shorter and lighter scales are gradually passing out of use. The increased weight of railroad cars and their proportionately increased capacities have brought this about.

The railroads are now installing concrete and steel scales, the only wooden

portions being the coping and deck. During the past year the Victor-American Fuel Co. installed four, 74-ft., 100-ton scales with concrete foundations and steel construction throughout, including the coping and deck. It is their practice to place all scale tracks on a 2 per cent. grade to enable the loaded cars to start

readily in the most unfavorable weather. In order to attain this grade a tapering plate girder was fabricated which measured 36 in. at the high end and 18 in. at the low. Resting on the top of each girder, is a 2-in. oak plank, running the full length of the scale, to serve as a cushion; upon this is laid the steel deck, covering the scale and finally the track rails, which are securely bolted through deck and cushion into the girder. These scales have given satisfactory service.

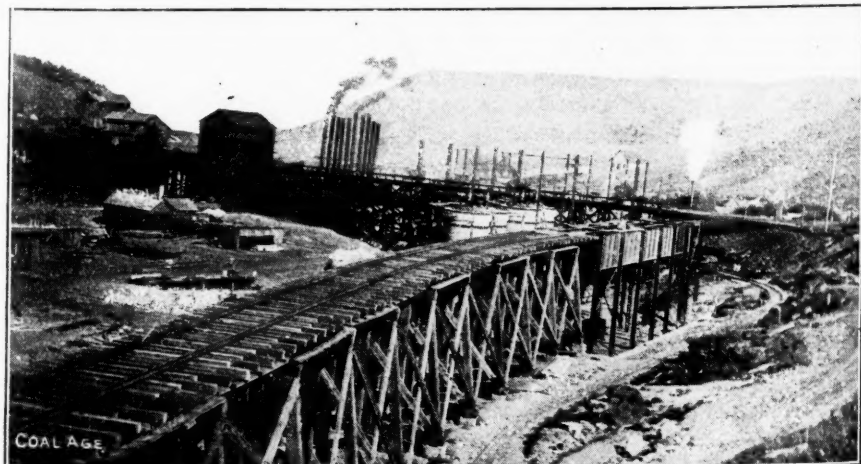
The usual practice of landing the empty railroad cars at the upper end of the yard and then dropping them by gravity to the tippie and on to the loaded storage tracks is generally followed. There are usually from two to four loading tracks under the tippie and the gradient varies from 1 to 2 per cent. It is customary to provide a sufficient number of derailleurs to take care of runaway cars. The size of the yard is made as nearly proportional to the tonnage as possible: the usual allowance being a foot of track per ton of production for both the empties and loads.



DELAGUA TIPPLE, EQUIPPED WITH CROSSOVER DUMPS AND THREE CAR FEEDERS



A VIEW AT PRIMERO, SHOWING TYPICAL MINERS' DWELLINGS



POWER PLANT, TIPPLE AND WASHERY AT HASTINGS, COLO.

SYSTEM OF MINING

Both the double- and triple-entry systems of mining are in use. In point of numbers there are probably more mines in the district employing the former. Ordinarily, entries are driven 12 ft. wide, although this standard may vary as much as two feet. Crosscuts are driven as often as necessary to keep good air up to the working faces, being generally placed at intervals of 60 to 100 feet.

The room-and-pillar method of mining with numerous modifications is used, there being no mine in the district employing the longwall method. The accompanying map of the Gray Creek mine of the Victor-American Fuel Co. may be taken as typical of mining practice in this district. Numerous geological disturbances will be noted among the more important of which is a broad and regular dike, crossing the Main South entry nearly at right angles between the 5 and 6 West Entries and a well defined and persistent fault with a throw of 14 ft. to the east and south of the shaft.

The original practice in the majority of mines in this district was not to pull pillars on the advance until the boundaries were reached in any particular section. When a mine was started on the retreat a great number of rooms and entries would be found so badly caved that enormous expense was incurred to put them in shape for the pulling of pillars and often large blocks of valuable coal were lost, as will be noted on the accompanying map. Added to these difficulties a serious squeeze often occurred.

In later years the old practice has, to a large extent, been abandoned and a number of systems devised by which the pillars may be pulled as soon as possible after rooms are finished without doing injury to the permanent haulageways. This arrangement has the advantage of permitting the concentration of a large number of men in a small area, besides simplifying the ventilation and haulage. The panel system, with certain modifications has a number of followers, who claim excellent results from its use.

Rooms are, whenever possible, driven either on the strike or on some angle up the pitch. The usual width is from 22 to 25 ft., although some are driven as narrow as 18 ft. and others as wide as 30 ft. Unless the amount of cover is excessive the pillar is approximately the same width as the room. The practice of driving long rooms, 600 to 700 ft., has been generally discontinued and the average length of rooms is now from 300 to 400 feet.

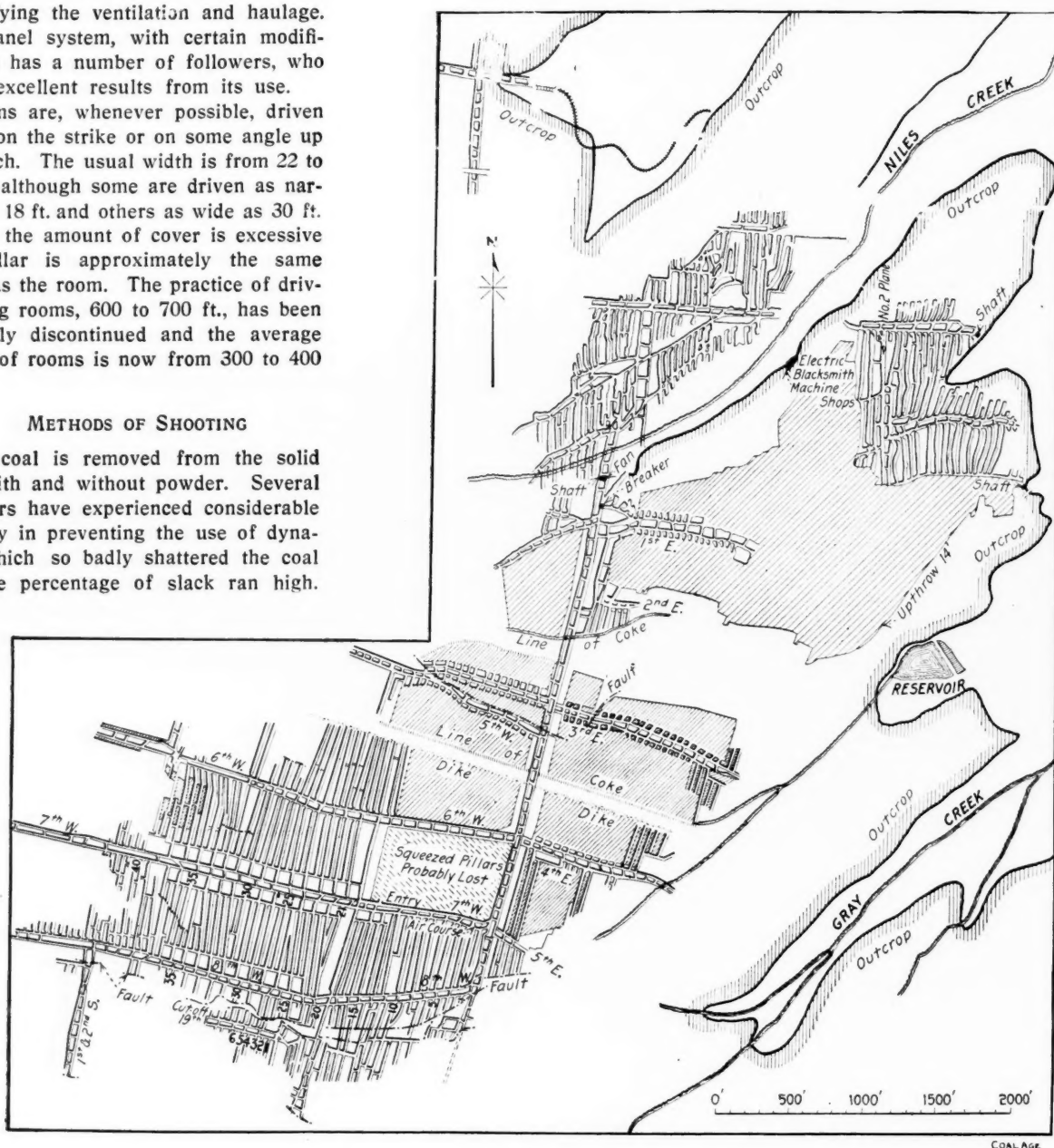
METHODS OF SHOOTING

The coal is removed from the solid both with and without powder. Several operators have experienced considerable difficulty in preventing the use of dynamite which so badly shattered the coal that the percentage of slack ran high.

hand. Considerable experimental work has been done with the hydraulic cartridge. This device is a modified form of the hydraulic jack and could it be made to work successfully in all these coals, would be a great boon to miner and employer as well. It is a well-known fact that in certain coals, it has proved a de-

per cent. As mined today the slack in ordinary mine-run varies from 35 to 60 per cent., the percentages lying mostly between 45 to 50.

The ventilation of the mines is handled in practically the same manner as in other coal mines the country over. The main haulageways usually carry the



MAP OF THE VICTOR-AMERICAN FUEL CO.'S GRAY CREEK MINE SHOWING TYPICAL FAULTS AND DIKES

This practice has been finally discontinued. Black and permissible powder are used exclusively except when in grading hard rock is encountered. Then dynamite is resorted to. The shots are fired by regular shotfirers employed for that purpose.

The number of mining machines in use in this district, at present, is not large, but steadily increasing, especially where mining is carried on in low coal.

The holes for shooting are bored by

cided success, but there seem to be others, in this field, which, on account of their elasticity and toughness, do not yield readily to the cartridge. It is probable that with a few simple modifications it can be made to do the work successfully in all coals.

VENTILATION

In addition to its many other advantages the hydraulic cartridge will cut down the proportion of slack at least 25

fresh air into the mine, while the back entries, or air courses, carry the return air. The air is split whenever a given area can be better served by so doing. Overcasts are used much more frequently than undercasts. They are ordinarily built of old rails, brick and cement, making them both cumbersome and expensive. Cylindrical pipes of extra-heavy galvanized-iron for this purpose would be light, comparatively cheap and much more easily han-

dled. Probably something along this line will eventually be adopted.

Brattices and doors are usually made of wood, but since the terrible fatalities of the past two years, in which so many lives were lost, the wooden door has been giving way to an interchangeable steel one and the old style brattice to one built of rock or brick laid up with cement mortar. So-called noncombustible brattice cloth is used, but, as this material loses its noncombustible property in time, great care must be exercised to protect it from fire.

MINE LIGHTING

In all mines where electric power is used, the main haulageways and partings are lighted with incandescent lamps. In nongaseous operations, the miners all use the lard-oil pit lamp.

The storage battery electric lamp would

ever, of such extent to make pumping a serious problem except in a few cases. In all mines in pitching seams considerable water finds its way to the lowest levels from which points it must be pumped to the surface. All other parts of the mines are dry and inclined to accumulate dust unless careful sprinkling is maintained. This is now being done in a systematic and thorough manner, the dust being washed from the timbers and sides of the passages and the floors thoroughly saturated at regular intervals. The operators now employ a large number of private inspectors, who give every detail, affecting the safety of the men underground, their most careful attention.

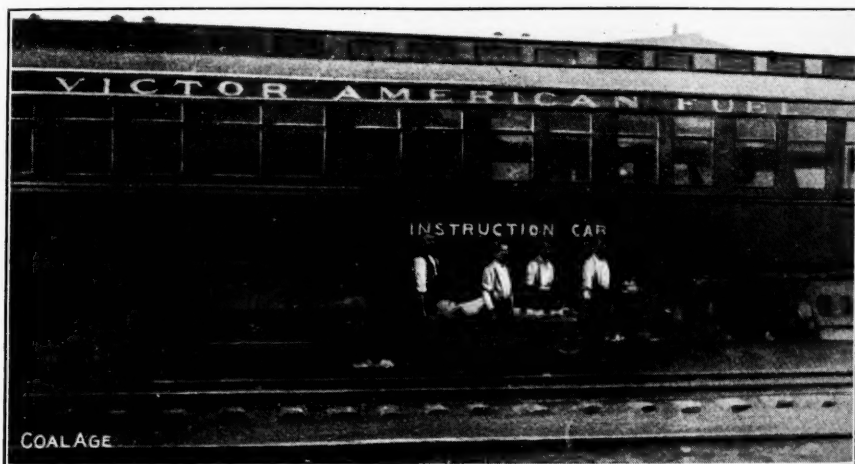
There are approximately 14,770 men employed in and about the coal mines of Colorado of which number, 5550 are working in the mines of the Trinidad dis-

trict. The wages paid are good, when the class of labor obtainable is considered. A good miner earns an average about \$125 per month after powder, light, hospital and rent deductions are made; the more inexperienced will make from \$70 to \$90. The wages of drivers and other company men are in proportion.

Great attention is being paid, by the larger operators especially, to first aid and rescue instruction. A proficient instructor is in charge who looks after all rescue and first aid apparatus and who gives instruction upon these subjects to regular classes composed of miners and company men generally.

Regular rescue crews are maintained which are held in readiness to go to the assistance of any mine in this or neighboring districts which may need them. A number of heroic men have thus given up their lives in the service of the unfortunates in other mines than their own. The U. S. Government car, in charge of Prof. Roberts, spends a great deal of time in the district and is doing most excellent work.

In 1910 the total coal production of the state of Colorado was 12,104,887 short tons of which amount, 5,595,664 tons were mined in the Trinidad district. There are 3164 beehive coke ovens in the state, although in the year 1910 some of them were not working. The Trinidad district has 2960 ovens of which number 2400 were burning during that year, in which time, the total coke production of the state was 1,190,901 tons and of the district 1,095,922 tons.



INSTRUCTION AND FIRST-AID CAR OF THE VICTOR-AMERICAN FUEL CO.

appear to be the future mine light. A local man, V. Patton, has perfected and patented a device, by which, in the event of the insulation wearing through or any other accident happening to the lamp whereby an arc would be made, the current is automatically cut off.

The operators have been experiencing great difficulty in teaching the ignorant miner the proper care and use of his safety lamp. It often happens that he becomes dissatisfied with the amount of light his lamp is furnishing and keeps turning up the wick until he has the gauze so badly smoked that the lamp is unable to burn. He then proceeds, if possible, to open the lamp. It has become necessary, in a number of cases, to subject the offender to fine or imprisonment in order to check the practice. The new lamps now purchased are magnet-locked, which will eventually obviate this trouble.

THE DUST PROBLEM

The Trinidad district is located in a rather dry, arid country. There is a small sub-surface water flow which is not, how-

ever, of such extent to make pumping a serious problem except in a few cases. In all mines in pitching seams considerable water finds its way to the lowest levels from which points it must be pumped to the surface. All other parts of the mines are dry and inclined to accumulate dust unless careful sprinkling is maintained. This is now being done in a systematic and thorough manner, the dust being washed from the timbers and sides of the passages and the floors thoroughly saturated at regular intervals. The operators now employ a large number of private inspectors, who give every detail, affecting the safety of the men underground, their most careful attention.

MISCELLANEOUS DETAILS

As a usual thing the operator furnishes the miner's dwelling house, charging him a small rental. In some cases a small charge is also made for water, but usually it is furnished free with his house. His fuel and light are given him at cost plus from 10 to 20 per cent. He is provided with medical and hospital attendance by the payment of a small fee. The sanitation of his dwelling is regulated and inspected. His children are obliged to attend school until at least 14 years of age. This is the law and it requires the combined efforts of the officers and the operators to enforce it, as the miner would often take his boys underground as soon as they are strong enough to

Matanuska Coal Field

The high-grade coals of the Matanuska Valley, Alaska, are the subject of a timely report just issued by the United States Geological Survey. The Matanuska coal field is the area to which Secretary Fisher recommended that a Government railway be built, and the Geological Survey report, with accompanying detailed maps, showing the areas underlain by coal strata, the most feasible routes for railway approach, and other specific and authoritative information, constitutes a valuable contribution to the present Alaska fuel problem.

The report is issued as Bulletin 500—"Geology and Coal Fields of the Lower Matanuska Valley, Alaska," by G. C. Martin and F. J. Katz. The accompanying maps show the geology, structure, and position of the coal beds and the report gives detailed measurements of the individual coal seams and analyses of the different grades of coal.

The maps, which are on the scale of a mile to the inch, will enable the constructing engineer to lay out the most feasible railroad route and will also provide the coal miner and operator with an adequate base for planning the work of prospecting the individual coal beds through drilling, shaft sinking, or tunnel driving.

Notes on Underground Fires

By James Ashworth *

Mine fires naturally result from a large variety of causes. Many, and indeed the majority of mine fires, are the result of criminal negligence of the rules and regulations made to safeguard the lives of miners; many more arise from the gross carelessness of miners or the mine officials.

The worst case of criminal neglect of rules that ever came under my personal notice occurred in a mine in which safety lamps were used and no open lights permitted. On one of the main roads in this mine there was a blower of gas that had been in continuous active operation for a considerable time. It was the duty of one of the mine officials to inspect this blower, after the miners had left the mine, each day. On making his round of inspection one afternoon he was startled to find the blower of gas had been ignited and was burning fiercely. Fortunately he was able to extinguish the flame before any serious damage had resulted. It was never discovered who was responsible for the ignition of the blower, as a subsequent investigation and search of the miners did not reveal any matches or lamp keys in their possession. Evidently someone had disobeyed the regulations of the mine, either by carrying matches or by tampering with the safety lamp.

A notable instance of gross carelessness on the part of the miner is found in the disastrous and fatal fire that occurred at the Hamstead colliery, in England, sometime since. In this colliery the miners used common tallow candles, which were stored at the bottom of the downcast shaft, in a large box. It was the custom for each miner to cut off his daily supply of candles from the bunch that was kept in this box. In the present case a miner, instead of cutting his supply of candles from the bunch, burned the wick or cord holding the candles and dropped the bunch back in the box and closed the lid. When the fire was discovered later it was burning fiercely, having ignited the woodwork about the pit bottom. As a result of this fire a large number of lives were sacrificed.

The fan at this colliery was not reversible, and the accident aroused great interest in the question of whether the ventilating fan at a colliery should not always be so constructed that the air current in the mine could be reversed on short notice. The question of reversing the air current in a mine, while the men are at work, has never been seriously debated and is still unsettled. Many claim that the cure would be more dangerous than the disease, because the men remaining in the mine and ignorant

Instances of fires caused by criminal negligence, carelessness and the disregard of rules and mine regulations. Lessons taught by mine disasters. Rescue apparatus. Spontaneous combustion in mines. Humidity. Microscopic examination of coal. Effect of mine temperature. Direction of air current. Iron pyrites in coal. Manner of handling mine fires.

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of the changed circulation would be trapped and suffocated.

The terrible disaster at the Cherry mine in Illinois in November 1909, by which 259 lives were sacrificed, was the result of combined carelessness and negligence. The fire was started by a car of baled hay that was pushed too close to a burning torch at the side of a track. It was bravely fought for some time by the men at the bottom of the shaft; but these men failed to send word in to the workers in the mine, in time for them to make good their escape. Many of these men were trapped, their escape being cut off by the smoke and gases of the fire. The ventilating fan at the Cherry mine was reversible, but the reversing of the air current, which was done later, cost the lives of some of the rescuers.

The Cherry disaster taught many useful lessons, among these may be mentioned the danger of an unprotected light on the shaft bottom; the need of greater caution in the handling of combustible material being taken into the mine; the danger of reversing the air current; the need of greater fire protection at the shaft bottom; and the need of fire drills. The rescue of twenty-one men from this mine, after a period of eight days, teaches that it is unwise to assume in any case that all of the miners in the mine are dead or beyond rescue. There should always be hope till the absolute truth is known.

I will mention but one other instance, which occurred recently in the old Hedgesford colliery, England, and which shows the criminal neglect on the part of the mine management to establish a proper system and supervision of the underground workings. At this colliery five men lost their lives by suffocation caused by the smoke of a fire that started in a cabin on the intake road. It is supposed that a boy when trimming

his lamp in the "shukey" (underground cabin) set apart for that purpose, threw a burning wick on the floor and did not take the trouble to extinguish it. The cabin was located about thirty yards from the bottom of the downcast shaft. When the fire was discovered the flames had traveled along the oil-saturated floor and ignited some cars loaded with coal that were standing ready to be hoisted up the shaft. A workman nearby seeing the flames made an attempt to extinguish them, but failed to do so and went for assistance. The overman who first arrived ordered the opening of the separation doors leading to the upcast shaft. This short-circuited the smoke and gases of the fire and kept the most of it from entering the mine, where about one hundred men were at work. A little later the under-manager arrived and ordered the doors to be closed again. Most of the men working inside had escaped, but five men, including one brave fellow, Thomas Stokes, who volunteered to rush through the smoke to warn the inside men lost their lives. When the flames were finally extinguished but one pony out of twenty in the mine was found alive.

This last instance points several lessons. An astonishing feature is the fact that during the excitement no one thought of stopping the fan. Among the lessons to be learned are the need of more thorough supervision underground; the need of better fire protection and fire fighting apparatus underground; and the building of all shanties and underground engine rooms and pump-rooms of incombustible material, as far as practicable.

USE OF RESCUE APPARATUS

In England, it appears to be customary for a certain group of collieries to combine together and maintain a central rescue station and brigade. In the instance just mentioned an early call was made on the station for help. At the time the call was made the principal part of the available force of the station was away, having been called to assist in extinguishing a fire at the Jammage colliery. In response to the second call, however, a few men were sent with rescue apparatus. At the inquest, referring to the use of rescue apparatus it was pointed out that even if the apparatus had been on the ground it would have been of little use because there was no means of bringing the men through the smoke.

Here is an object lesson revealing the fact that, in all cases, the rescuers should each carry a second apparatus in addition to the one worn, to enable them

to bring out men that may be found alive. The importance of this was demonstrated at the Bellevue disaster in Alberta, Canada, December 7, 1910, when two men, although they had never worn a Draeger apparatus before, were safely brought through a considerable length of airways filled with smoke and gases. For this purpose it is evident that the apparatus should not be heavy or cumbersome. Many of the forms of apparatus in common use are poorly adapted for mine work, on this account. Mine-rescue apparatus should be so simple that a novice, who has never worn the apparatus before, can put it on and use it successfully. An important point in rescue apparatus is that it shall not have any small apertures that can become suddenly clogged. This has in some instances caused the failure of the apparatus with fatal results.

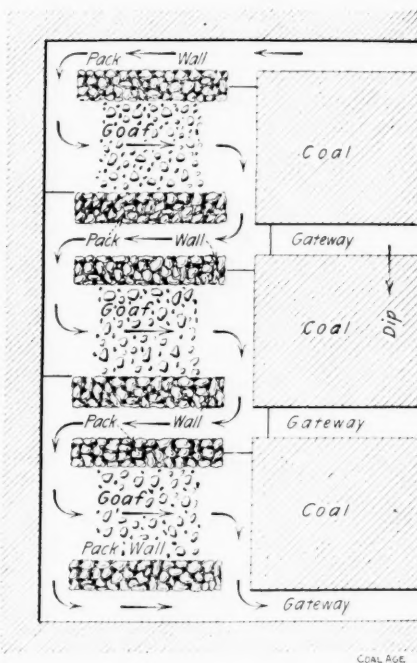
SPONTANEOUS COMBUSTION

A large majority of underground fires are undoubtedly due to spontaneous combustion, resulting in what are generally known as "gob fires." These form a very important class of mine fires. Such fires have always been a great source of trouble in mining and their origin is still a matter of speculation with a large number of mining men, whose opinions differ widely as to the exact cause and the best remedy to be applied. The truth of this statement is evident from the numerous references to the subject in papers contributed, from time to time, to scientific journals and institutes. Quite recently, at an inquiry in regard to the cause of an explosion, a mine inspector suggested the following points might well be investigated; namely, (1) the affinity of oxygen for the various coals, shales and rocks; (2) the heat conductivity of such coals, shales and rocks; (3) the relative inflammability of such coals and shales; (4) that analyses of the various coals and shales be made, and the gases contained in them ascertained; (5) the structure of various coals as shown by the microscope; (6) the hygroscopic moisture content of various coals; (7) the fineness of the particles of crushed coals; (8) the shape of such particles; (9) the temperature at which oxidation becomes destructive; (10) temperature and humidity of the air in various parts of mines taken every four hours of the day. This classification suggests, at least, how much there is yet that may be learned in regard to the spontaneous ignition of coal.

HUMIDITY IN MINES

The writer firmly believes, as the result of his own experience of many years in mines where gob fires were a perpetual trouble and danger, that the

humidity of the mine and the mine atmosphere represents the chief factor of safety. It may be generally stated as a fact that will be accepted by all, that if it were possible to make the air in mines practically dry there would be no gob fires. This, however, is a practical impossibility, in mining. But, owing to the increase of the heat and the temperature in deep mining, and the difficulty the miners experience in working in a moist, warm atmosphere, it is necessary in deep mines to maintain, as far as possible, a drier condition of the air current. In other words, it is important to avoid humidifying the mine air as much as possible. This has led some to think that a seam of coal that is subject to spontaneous combustion at a mod-



SHOWING PROPOSED DIRECTION OF AIR CURRENT TO PREVENT "SWEATING" IN MINING ON DEEP PITCHES

erate depth, might be less susceptible at a greater depth. This, however, is not the case, since there is always sufficient moisture in the air of mines to make combustion possible, and the increased heat favors combustion.

I would suggest that the daily and systematic use of the hygrometer throughout a mine subject to spontaneous combustion is of the greatest practical value as a means of indicating, (1) any increase or decrease in the heat of the air currents; (2) and most important, any abnormal rise in the water-vapor content. The latter observation gives the earliest indication of any tendency to spontaneous combustion and the development of gob fires, in mine workings.

No experiments have been made, as far as my knowledge goes, to discover what effect hygroscopic water has on the

liability of coals to take fire spontaneously. We are aware, however, that the higher the percentage of hygroscopic water in coal the more easily the coal disintegrates; and this would naturally increase the rate of oxidation rapidly.

As an illustration of the influence of moisture to produce spontaneous combustion, I recall an instance narrated by an engineer, then president of a society of mining engineers but now deceased. He was explaining why he substituted fan ventilation for furnace ventilation, in a mine. He stated that the mine was very subject to spontaneous combustion. At week ends and holidays it was customary to slow down the furnace, with the result that moisture condensed on the refuse thrown back in the gob. He observed that this moisture still remained when mining was again resumed, and before it dried up it was covered by fresh refuse. He stated, in conclusion, that he considered this moisture was the primary cause of the spontaneous combustion and frequent occurrence of gob fires in his mines. As a test, a fan was installed and kept running at a regular speed throughout "play days," with the result that the moisture was reduced and there were fewer cases of spontaneous combustion in the mine.

MICROSCOPIC EXAMINATION OF COAL

In passing, I desire to refer to a suggestion from a scientist, a Mr. Lomax, who has recently made a close microscopic examination of different coals. Mr. Lomax has produced some marvelously fine slices of coal for examination and for lantern purposes. These slices show that coal is not all black, and the resinous parts are easily distinguishable. He suggests that a further examination may prove of great value to mining by showing why one coal dust is more explosive than another, and also why one coal is more susceptible to spontaneous combustion than another. It has long been held by authorities that the fineness and the shape of the particles of crushed coal resulting from the natural pressure and movement of the strata, influence the tendency of the coal to spontaneous combustion, the reason being based on the ground that the finer the coal is crushed the greater the extent of surface exposed to oxidation, and the more rapid the oxidation the greater the heat developed.

In some deep coal mines the natural heat of the strata often ranges from 90° F. to over 100° F. While no actual data has been thus far produced to show that such increase of the mine temperature assists to any great extent the spontaneous combustion of the coal, yet there is a growing suspicion that it does exercise an undesirable influence in this regard, especially where the enfolding

strata are highly bituminous. Recent experiments have shown that tar is distilled from coal at a low temperature, and this fact may materially increase the liability to spontaneous ignition of the coal. It is reasonable to suppose that the high temperature and moist atmosphere, in many deep mines, greatly increase the risk from spontaneous combustion.

In the mining of an inclined seam of coal subject to spontaneous combustion the direction of the ventilating air current is important. See Fig. 1. Instead of the usual ascensional system of ventilation I would suggest that in this case the air current should be entered at the highest point in the mine and from thence conducted downward, especially if the mine is being worked on the longwall system. In making this suggestion I have in mind the effect of the deposition of moisture on the waste stored in the gob, to which I have previously referred, as assisting the disintegration of the fine coal and increasing the tendency to spontaneous ignition of the coal. It will be remembered that the capacity for carrying moisture in the air current increases with the temperature. If the cool intake air enters at the highest point of the workings its temperature gradually increases as it is conducted to the lower workings. Its vapor-carrying capacity is therefore increased regularly, and no moisture will be deposited in the face of any of the working places. On the other hand, if the cool intake air enters at the lowest point of the workings, this being the hotter portion of the mine, its temperature is raised and, as the air proceeds upward, it is cooled and deposits its moisture, from time to time, at the face of each working place. It is this deposition of moisture on the refuse or waste that greatly facilitates spontaneous combustion.

EFFECT OF IRON PYRITES IN COAL

In cases where iron pyrites is found in the coal the dampness deposited from the air current undoubtedly assists in the disintegration of the coal and encourages spontaneous combustion. In all the mines in which the writer has had serious difficulties with gob fires, iron pyrites has been present as a factor, and the point I would like to urge is that the greatest immunity from this serious danger is to be found in maintaining a dry (unsaturated) condition of the air current. An unsaturated air current will thus continue to absorb or take up moisture. There may, of course, be serious objections to this in the working of a mine generating explosive gas, especially where the mine has a tendency to become dry and dusty. The successful mine manager will have all of these con-

ditions in mind and consider the influence of each.

HANDLING MINE FIRES

The safest and most effectual, and in the long run the least costly way of dealing with a gob fire is to dig it out, whenever this is practicable. With present-day appliances this is not as dangerous work as it would have been years ago, when no oxygen apparatus was in use except the simple apparatus of Denayrouse, which consisted principally of an air-pump, but was often of great value. In many mines it is the custom to build clay walls or banks of sand and flue dust, so as to keep out the air and isolate the fire. In other cases, masonry walls or stoppings are built in the airways, as near as possible to the seat of the fire. In mines generating firedamp the work of isolating a mine fire by building stoppings is always attended with more or less danger. It is important that the work be done promptly.

The most recent disaster caused by the sealing off of a fire occurred in the mining of a coal field of deep inclination. A fire had started in the gob, but was not considered to be in a dangerous condition, and the management decided to first place dirt packs in the roadways and later to build masonry walls or stoppings. The places selected for the stoppings were at some distance from the seat of the fire. When the dirt packs were partly completed there occurred what is described as an "explosion," though no one appeared to have been burned; however, six men were asphyxiated. Unfortunately, at the present writing, there is no information available as to whether the so-called explosion was caused by the gases from the fire or by the firedamp generated in the inclosed space, or both combined; or whether the effect was simply a heavy fall of roof that drove the smoke and gases out onto the men and asphyxiated them. Only one man out of the six escaped alive. The account does not state in what stage of construction the stoppings were at the time of the disaster, nor to what extent the circulation of air had been stopped, and therefore no inferences can be drawn.

In the general discussion of underground fires, however, and without reference to their inception or surroundings, the question is open to argument as to which road should be closed first, the intake or the return airway. Speaking from personal experience, and that a most dangerous experience in this class of work, when seconds of time were important, the return-air road was plugged first, though the intake was not long behind. As a general rule, this course should be adopted, because as soon as the return airway is plugged the

smoke is driven back onto the fire and thus forms on the return side—the most dangerous side of the fire—a barrier of gases containing too little air and too much carbon dioxide to be explosive. Besides all this, the intake air is forced backward by the products of the combustion, and the building of the intake stopping is then accomplished in safety.

The use of water to extinguish a gob fire will later do more harm than good, unless it can be applied in sufficient quantity to completely drown the fire. The better plan is to use water, if at all, in sufficient quantity only, to cool the heated matter as it is being dug out.

Underground fires wherever they occur, and from whatever cause they arise, are always dangerous and require the most prompt decision and determination in their treatment. For this reason the mine that is equipped with adequate apparatus for fighting such fires will be most assured of success. No set of rules could be drawn that would fit all conditions, and therefore the best remedy in the extinguishing of an underground fire is a cool head to direct the operation.

The Big Stick for the Operator

A correspondent in the *New York Times* under the euphonic *nom de plume* of "Gentleman Janitor" writes as follows:

I will begin by saying that my subject is coal, furnace coal for the hot-air furnace. I am one of three house owners who compose an organization known in our Brooklyn neighborhood as gentlemen janitors. Why? Because we look after our furnace requirements mornings and at bedtime. Each has "a man" who fills in between times and puts out ashes.

We three know just what sort of coal we pay for at the rate of \$6.75 a ton just now, though every April it is Brooklyn's custom to lay in a winter supply at the short price of \$6 a ton. All householders who employ "a man" for the entire care of a furnace know not what they pay their money for. But we gentlemen janitors do, and we know that fully an eighth of every ton of furnace coal (egg size) is made up of off-scourings from the coal regions of Pennsylvania—slate, a few real stones, slag, and iron ore. The grate of my furnace I have to rake out below fully three times a week, and sometimes the slag has to be dug away, in the form of a mat that forms over the grate. What remedy have we? A Congressional investigation? My complaint applies to all the dealers, or to four, anyhow.

GENTLEMAN JANITOR.

Brooklyn, N. Y., Feb. 19, 1912.

[Why go to Pennsylvania for coal experts when we live so near Brooklyn?]

Coal Mine Ventilating Equipment

By W. M. Weigel*

The relative advantages of pressure and exhaust fans under certain conditions of mining are here indicated and a discussion of reversible fans serves to point out the dangers as well as the benefits that may attend their use. Fan drives are considered and also the details of building construction. The sixth of a series of articles on mechanical ventilators.

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The Sullivan fan like the two makes of high-speed fans mentioned in a previous article, has a large inlet as compared with the diameter of the wheel and has short blades, usually 42 in number, curved forward in the direction of rotation. Every third blade is larger at the center or back of the fan wheel and projects into the inlet space, as is indicated in Fig. 2. The distinguishing feature of this type of fan is the arrangement for changing the fan from an exhauster to a blower or vice versa. Instead of using doors or dampers for this purpose the whole hood or casing is revolved about the fan shaft as a center.

This hood is shown in Fig. 1 in the position required for blowing and in Fig. 3, it is shown adjusted for running the fan as an exhauster. It is turned by means of a hand wheel and a pinion that engages a gear segment on the hood.

only difference being in the arrangement of the casing with regard to the discharge and inlet openings. The discharge of the exhaust fan is usually di-

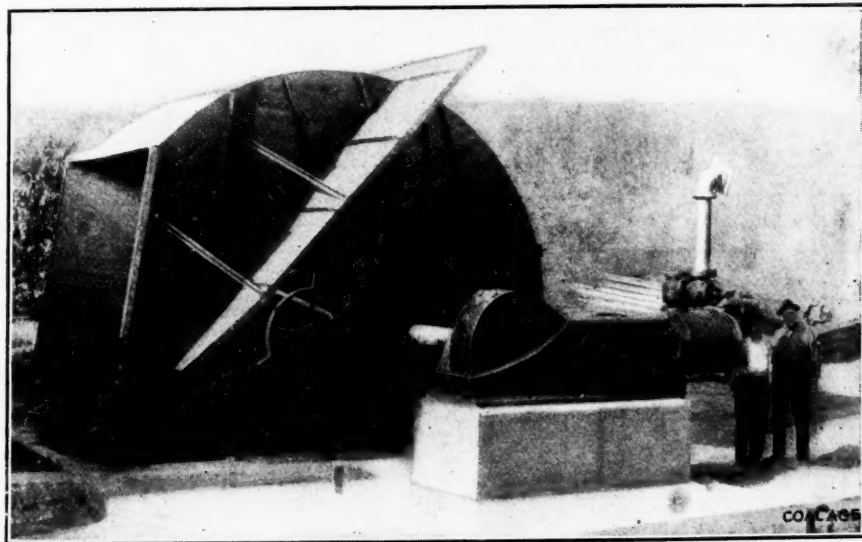


FIG. 1. TEN-FOOT SULLIVAN FAN, BLOWING POSITION

When blowing, the air passages on either side of the fan are open to the atmosphere on top and the wings on each side of the discharge chimney serve to close the openings between the fan drift and these passages. When exhausting, the wings then close the openings at the top of the side chambers and at the same time allow a free passage from the drift to the fan inlets. The air current may easily be reversed without stopping the fan. This type of fan is made in sizes from 6 to 20 ft. in diameter and is always built with a double inlet.

PRESSURE VS. EXHAUST FANS

Ordinarily, a fan may, with equal facility, operate either by blowing air into the mine or exhausting it from the mine. The construction of the fan wheel is practically the same in either case, the

rected upward and the chimney or stack enlarges towards its outlet to the atmosphere. The discharge of a blowing fan is usually taken off in a horizontal or slightly downward direction, and is only enlarged enough to make it equal in size to the connection with the mine opening. The power required to force an equal amount of air through the mine is the same with both systems.

Whether the exhaust or the blowing system should be employed will depend to a great extent upon the conditions of the mine and the methods of working. In American practice, the working entrance, whether shaft or drift, is kept unrestricted, or, in other words, it is made the downcast or intake when an exhaust fan is used and is made the upcast or outlet in case a blowing fan is employed. The reversal of this practice requires

doors or air locks in the main operating openings, and these devices are a source of delay and annoyance. When the working shaft is the downcast, accumulations of ice, if the shaft is at all wet, are liable to cause trouble during cold weather. On the other hand, if the blowing system is employed and the intake is wet, trouble quite as serious may arise from the choking of the air shaft.

With the exhaust system, the atmospheric pressure in the mine is a little less than that outside. In case the fan stops the pressure in the mine will rise, tending to hold back the gases discharged from the coal and waste places. With the blowing system, if the fan stops, the air pressure will fall slightly, having the effect of a fall in the barometer, and allowing greater quantities of gas to flow into the working portions of the mine and haulage ways.

Where the blowing system is employed, the return airway is used for haulage and if the mine is gaseous this arrangement may not be advisable on account of the danger from drivers' lamps, or sparks from the trolleys of electric locomotives. On the other hand, hauling on the intake, which is customary with the exhaust system, befouls the air before it reaches the miners, and allows the dust from the haulage ways to settle where it is most dangerous. When hauling on the return, the dust and foul air are immediately removed from the mine without reaching the working face. In general then, where the mine gives off gas in any amount and is not dusty, an exhaust fan should be employed. If the mine is dusty and not gaseous a blower is to be preferred. If both dusty and gaseous, the case will usually have to be decided by determining which of the two conditions is the more dangerous, keeping in mind also the system of haulage that is to be employed.

REVERSIBLE FANS

With a suitable arrangement of doors or dampers and connections with the mine, any fan may be operated either as a blower or as an exhauster. The Sullivan fan is reversed by rotating the housing as previously explained. In general, making a fan reversible requires that the inlets and discharge be connected with both the mine opening and the atmosphere, the course of the air being determined by the position of the doors or dampers in the several passages.

In Fig. 4 is shown an arrangement of doors and stack damper that permits reversing a fan, primarily designed for use as an exhauster. In this arrangement the doors and dampers are connected by reach rods and toggles so that

the positions of all are changed at the same time and by one operation.

A reversible blowing fan for a slope mine is shown in Fig. 5, and the method of converting it into an exhauster is clearly indicated. When blowing, the side doors of the airway are in the dotted position, and the end of the spiral casing is in the position shown by the solid lines. When exhausting, the side doors are in the position of the solid lines and the movable part of the spiral

all times to operate with the natural currents and this is always a desirable feature, other things being equal. If a mine makes a large quantity of gas and there are considerable areas of gob or worked out portions for its accumulation, the fan, running as a blower during the day or working shift, will tend to hold back the gases in these places and prevent their overflow into the workings; then at night when the men are out, by running the fan as an exhauster the pres-

should be avoided where there is any liability of an explosion, for in such an event the fan is almost sure to be wrecked. However, where there is no possibility of danger from this source, that is, where the mine is wet, and there is absolutely no gas, the fan at a drift mine is most conveniently placed directly in front of the airway. When the airway is a shaft, the fan should be kept at some distance from the opening if there is any chance of subsidence or caving.

By placing the fan to one side of the inlet and connecting it to the mine opening with a passage having a right angled turn, it is rendered reasonably safe from destruction, and may be further safeguarded by placing large explosion doors where the fan drift turns off from the entrance to the mine. For a shaft mine, the doors should be directly over the shaft and in the case of a drift or slope they should be set squarely in front of the entrance.

These explosion doors are preferably made double and as light as possible, using thin steel plate or lumber. With a blowing system, they should be weighted just sufficiently to overcome the maximum ventilating pressure required. With an exhaust fan the air pressure is sufficient to hold them closed. The doors should be made as nearly air tight as can be without causing them to stick in the frame.

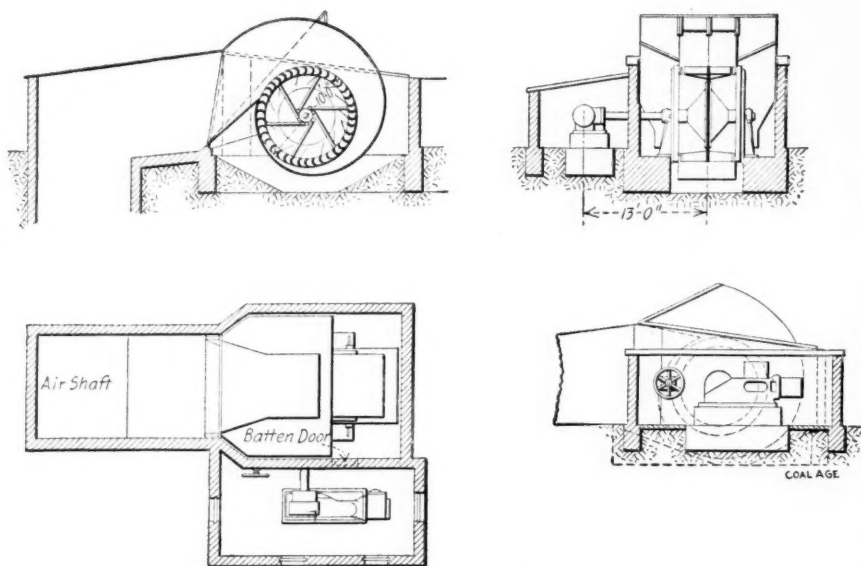


FIG. 2. SULLIVAN FAN AND FAN HOUSE

casing is dropped down as shown by the dotted lines.

Many mines are now equipped with reversible fans, and such an installation has several important advantages. However, reversal of the air current, unless of such frequent occurrence as to render its operation entirely familiar, should be permitted only on the order of some competent person in authority. Otherwise the consequences may be disastrous. Just what effect a reversal of the air is going to have in a particular mine should be carefully studied out, so that in case of emergency (and reversible fans are usually employed for such cases) the right thing may be done.

In the event of a mine fire or explosion, the reversal of the current may serve to draw the smoke and gases away from the outlet best calculated to facilitate the escape of the men underground and thus be the means of saving life. On the other hand, when the location or extent of an accident is unknown, or the effect of reversing the air not previously determined, such a procedure may operate to cut off the means of escape, and add to the catastrophe.

Reversible fans may be employed for other than emergency purposes. If a mine has considerable natural ventilation the direction of which is opposite in summer and winter, the fan can be made at

sure may be decreased and the accumulation of gases drawn off and carried out of the mine by the air current, at a time when their presence in the main airways offers the least danger.

LOCATION OF FANS

The ventilating fan is found in many instances to be placed close to the inlet of the mine and sometimes directly in front of or over it. This arrangement

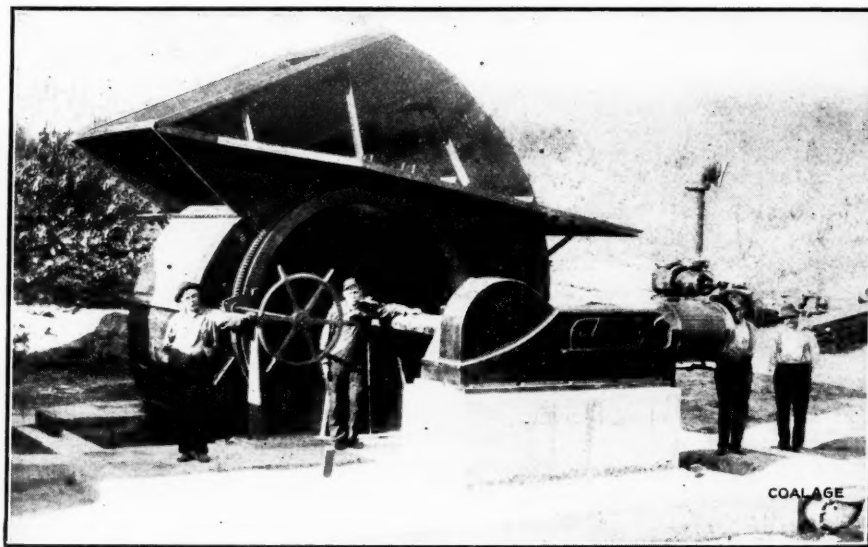


FIG. 3. SULLIVAN MINE FAN, POSITION FOR EXHAUSTING

Frequently these doors are not large enough to be of value in case of emergency. Their area should be at least equal to that of the shaft or entry, and greater if possible. The force of an explosion will tend to blow open the doors and save the fan, as the main explosive effect will travel in a straight line if given a chance, or until some powerful obstacle intervenes. To insure safety the length of the fan drift between the

turn at the explosion doors and the fan should be at least 4 to 6 times the width of the mine entrance. That is to say, if the airway is 10 ft. wide, then the fan should be placed not less than 40 ft. to one side.

FAN DRIFT CONSTRUCTION

Formerly fan drifts were, as a rule, light constructions of wood, the idea being that the force of the explosion would blow them down and protect the fan, but the danger from fire was a constant menace and it was difficult to keep them air tight, so present practice tends toward the use of steel plate, or masonry of brick or concrete. Steel construction for this purpose consists usually of plates $\frac{1}{8}$ in. to $\frac{3}{8}$ in. thick, well riveted at the seams and held in place by angles or tee bars bolted to the foundation. All should be kept well painted inside and out.

The floor of the drift may be of concrete and foundations along the sides should be carried well below the frost line. The floor should slope to a drain pipe connected with the outside, as the precipitation of moisture is often quite heavy in the drifts of exhaust fans. If the fan drift is of brick, the walls should be not less than 9 in. thick, preferably

vided with a pipe for oiling from the outside.

The fan foundation should be substantial and carried to a sufficient depth, as the operation of a large fan is attended with considerable vibration. Brick or cut stone may be employed in its construction but concrete is usually better as well as cheaper, and is easily molded to form the lower part of the casing. In placing the anchor bolts, enough space should be left around them to allow for slight discrepancies between measurements made on the ground and the material furnished by the manufacturer.

The fan and casing are generally left

placed, and water power is rarely found at hand.

Fans of large diameter and slow rotative speeds are best driven by direct connection to steam engines. As a large fan runs at practically constant speed and load, the most favorable conditions are presented for the economical operation of its engine. Direct connected Corliss engines are used for many large fans where the speeds do not exceed 100 r.p.m. If higher speeds are required, then the fan may be belted to the engine or a high-speed engine employed.

Rope drives instead of belting are sometimes made use of in England and Europe, but not in the United States.

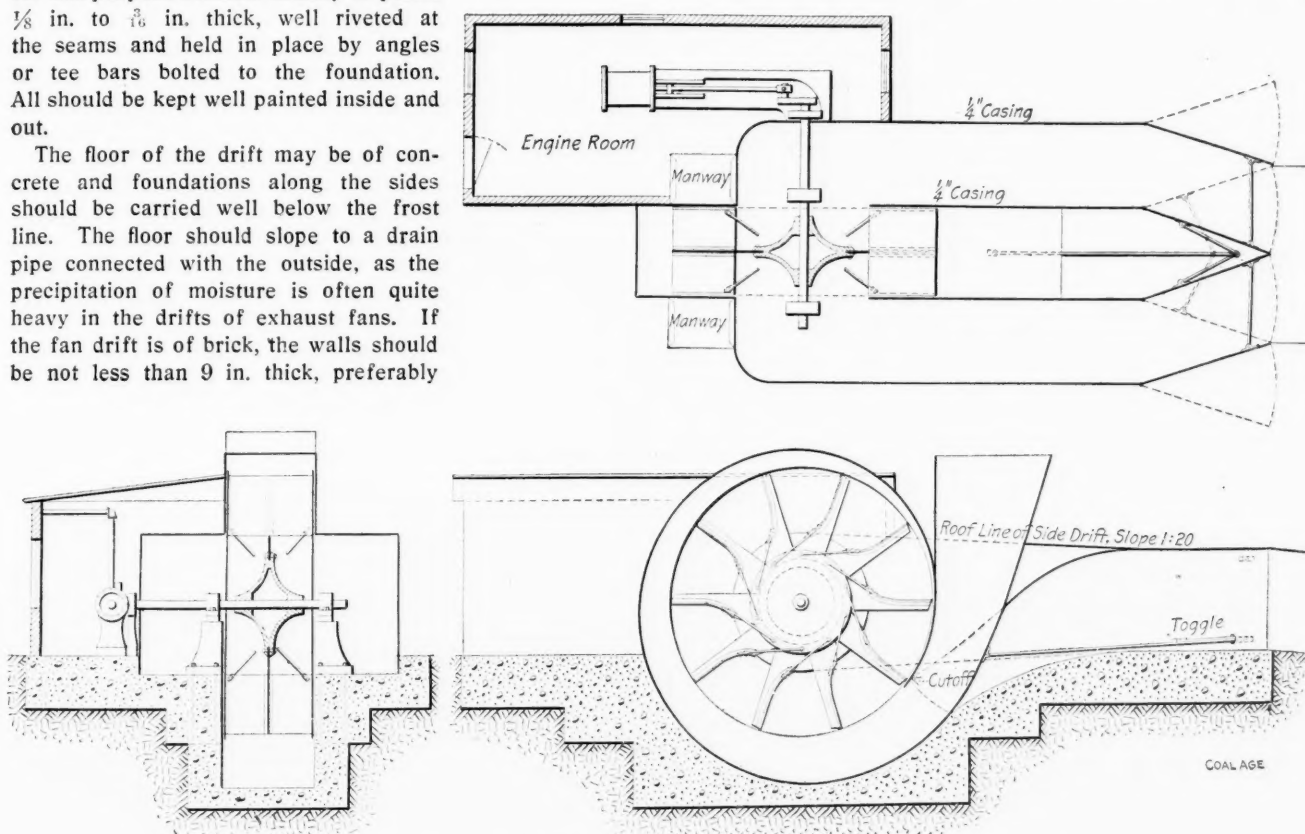


FIG. 4. DOUBLE-INLET REVERSIBLE BEARD-STINE FAN AND FAN HOUSE

13 in., and for high walls 18 in. The roof may be a brick arch but this construction is expensive and steel plates anchored to the brick walls or reinforced concrete is usually employed.

Concrete makes an ideal construction. It is as cheap or cheaper than brick, is more durable and requires less attention than sheet steel. The walls may be made thick and without reinforcing steel but perhaps a better and cheaper method is to use some one of the various systems of reinforcement adapted to walls, as danger of cracking is thus avoided. The roof may be made of the same material. Entrance to the fan drift should be arranged for near the fan by means of a double door or air lock. Fan-shaft journals, inside the drift, should be pro-

uncovered, but a house must be built over the engine or motor and preferably this should be of brick, concrete, or other fireproof construction.

Every precaution should be taken to insure the safety and reliability of the surface ventilating equipment, as upon it depend largely, not only the continuous operation of the mine but the lives of the men underground.

MOTIVE POWER

Almost any available motive power may be employed for driving fans. Steam engines or electric motors, however, are the almost universally adopted means as gasoline or gas engines are as yet somewhat unreliable for the isolated localities in which fans are often

As the fan and engine are usually located at some distance from the main power plant the engines are rarely run condensing. Moreover, water for condensing purposes may not be available at less cost than the saving made by using a condenser. The disadvantages of a belt drive are loss of power in transmission and the requirement of greater space, necessitating a larger building. There is also an increased chance of stoppage due to failure of the belt.

Often two engines are installed, one on each side of the fan. One engine operates the fan while the other is disconnected. Then, if the first should break down, the second can be connected in a few minutes and no serious delay oc-

curs. Such an installation, however, increases the first cost of the plant.

Electric motors are either direct connected, belted or geared to the fan shaft. Direct connection is to be preferred, but such an arrangement is as a rule, only possible with fans of high rotative speeds, such as the multivane and disk types. Slow speed motors can be built for the larger fans but their increased cost usually outweighs the benefits derived. Because of the small amount of attention they require, poly-phase induction motors are admirably suited for driving fans.

Speed regulation may be obtained with a steam engine simply by throttling or by adjusting the governor. With an electric motor the speed may be varied by any of the means generally employed for this purpose, but operating at speeds less than normal is usually attended with loss of power in the controlling resistances.

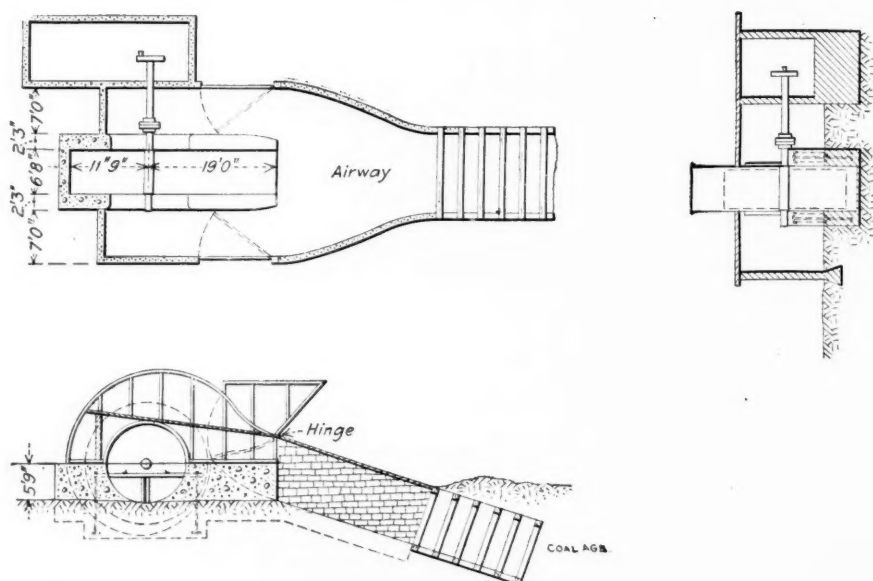


FIG. 5. REVERSIBLE JEFFREY BLOWING FAN, SLOPE MINE

A Difficult Piece of Shaft Sinking

The construction of the Catskill Aqueduct is deservedly attracting widespread attention. It is easily understood that many important problems necessarily have to be solved when it is proposed to carry an enormous supply of water from a mountain district to a point 100 miles distant, conducting it across a score of valleys, some of them several miles in width, as well as across so deep and broad a river as the Hudson. The part of this work that is of greatest interest to the mining profession is the shaft and tunnel construction.

The aqueduct may be said, if one speaks broadly, to parallel the Hudson River. Consequently, the route cuts across the tributary streams. These are creeks or brooks of no especial importance, so far as size goes. However, they mark the position of valleys, some of which are a number of miles in width. One of the largest is the valley of Rondout Creek. In crossing at this point, the aqueduct drops far below the surface of the ground and the bottom of the creek, and thus makes the 4½-mile passage from one side to the other.

A DEEP SHAFT THROUGH WATER-BEARING STRATA

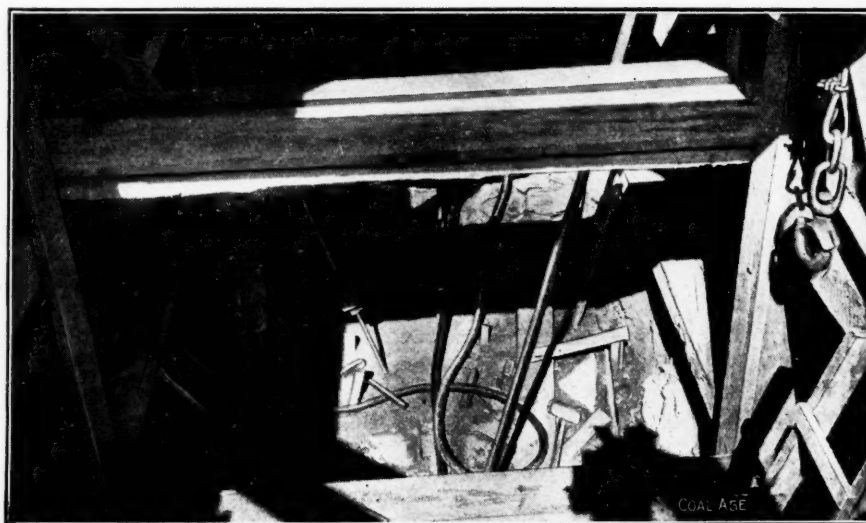
A vertical shaft at each end, and a third, located at an intermediate point, will remain as permanent features of this work. In addition, five other shafts were sunk to the tunnel grade in order to facilitate construction. One of these, No. 4, is 500 ft. deep and 10x22 ft. in horizontal section. Eighteen months were required to put down this shaft, and it was flooded six times. The strata passed through were as follows:

Special Correspondence

As supplementary to the article, "Use of Grout in Shaft Sinking," in *Coal Age* of Feb. 24, an account is here presented of a shaft-sinking operation in which cement grout was successfully used to combat an immense inflow of water. A large emergency pumping plant is also described in this connection.

Glacial drift.....	6 ft.
Helderberg limestone.....	226 "
Binnewater sandstone.....	39 "
High Falls shale.....	92 "
Shawangunk grit.....	134 "
Total	497 ft.

The trouble with water came, no doubt, almost altogether from the sandstone and the shale. But the water made its presence felt long before these strata were reached. A 4-in. test hole had been put down on the site of the shaft, and when, in sinking, a depth of about 80 ft. had been reached, a sudden inrush of water came through this hole, half filling the excavation. The emergency pumping plant had not yet been delivered; so the contractors were caught unprepared. However, by the use of an air lift and a couple of sinking pumps, the water level was lowered to a point near the bottom. A nipple was then driven into the hole and casing attached. The purpose was to fill the hole with cement grout. In order to carry out this plan, a



LOOKING DOWN INTO CONSTRUCTION SHAFT No. 4

1-in. pipe was put down to the Shawangunk grit; that is, to the 363-ft. level. The water was now permitted to return. Pressures were thus equalized and currents prevented. The grout was made in the proportion of one part cement to one part sand and poured down the 1-in. pipe, this latter being withdrawn as the grout filled the hole.

The problem of this one hole was solved as indicated, but the T. A. Gillespie Co. who were doing this work began to entertain fears as to whether the ordinary methods of shaft sinking would prove successful. It was understood that there was in the strata below, a great deal of water under considerable pressure. With subsequent events in mind, it is not difficult to see that a special pumping chamber in the side of the shaft should have been provided before permitting the excavation to pass

were large crevices a short distance beneath the bottom of the excavation running up to 8 in. in size. One of the largest of these crevices was distant only a foot and a half. As compared with the 2-in. bore holes, they promised plenty of trouble.

GROUTING UP THE CREVICES

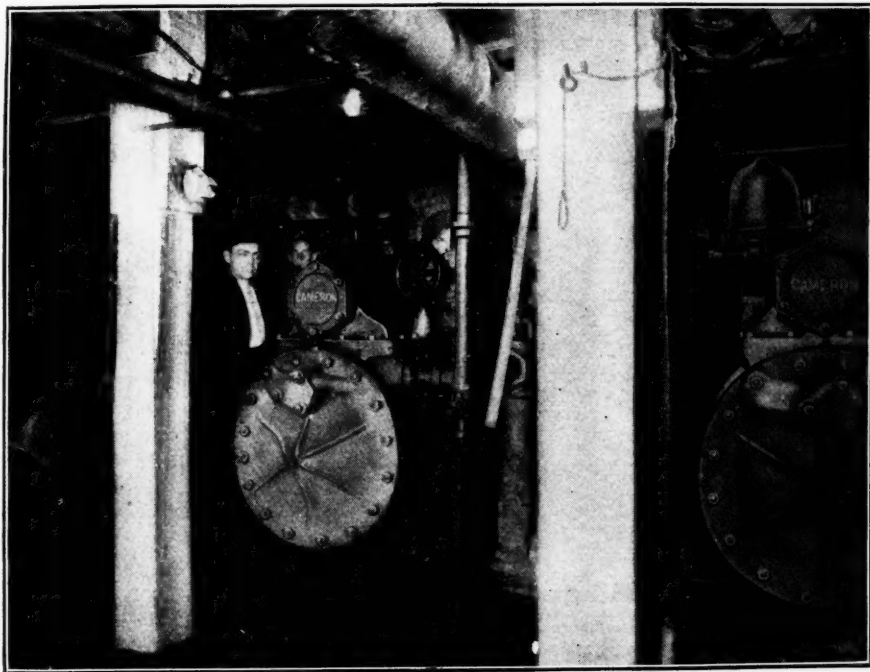
It was now proposed to deal with the water question by means of grout. Four special machines were set up at the mouth of the shaft. A 2½-in. pipe was led down the shaft to the bottom, where a 2-in. hose carried the grout to the point of use. At the beginning of operations, the grout gave some trouble by leaking back. It would come in through the spaces around the pipes and through cracks in the bottom. This difficulty was successfully met by mixing finely ground horse manure with the grout. The manure

sure of 275 lb. per sq.in., these holes were grouted up with 175 bags of cement. No one knew whether the small quantity of grout required meant that the problem was a small one or that it had been only partially solved. It would seem that a thorough application of the method of grouting ahead of the excavation should have been employed sooner; that is, before the water-bearing strata had been penetrated.

EMERGENCY PUMPING PLANT

Sinking was now begun again, and prosecuted until a depth of 320 ft. was reached. Several collecting rings had been arranged, and a number of sinking pumps installed in the shaft. The working space was much restricted and, moreover, it was difficult to secure easy, certain and adequate pumping capacity by the use of sinking pumps alone. It was determined to construct a pumping chamber off to one side at the 309-ft. level. This chamber was made quite large; 10 ft. high and 17x24 ft. in horizontal dimensions. Beneath its floor was provided a sump 5½ ft. deep and 16x22 ft. in area, having a capacity of 14,500 gal. Three 24x10x20-in. horizontal condensing pumps with a combined capacity of 1050 gal. per min., furnished by the Cameron Pump Works, New York, were installed in the special chamber and supplied with steam by three 100-hp. boilers set up at the mouth of the shaft. This arrangement was greatly facilitated by using pumps of the condensing type.

Before the installation of this powerful pumping plant was complete the sixth flooding of the shaft took place. Subsequently, no especial difficulty was encountered in connection with the water. More grouting was done, but, with one exception, none of the seams required more than 100 bags of cement. When the grit was reached, one hole gave trouble and required 348 bags of cement to stop the flow. The amount of water pumped from this shaft was 86,181,000,000 ft.-gal., and the total amount of portland cement consumed in the grouting operations was 971 barrels.



EMERGENCY PUMPING PLANT AT 300-FT. LEVEL

out of the limestone. This arrangement was made later, but the delay was the source of much trouble. Excavation went on, and the sandstone was penetrated. At the 200-ft. level, the amount of incoming water was only about 225 gal. per min. However, during the drilling of the sump, an additional 600 gal. per min. came in suddenly through one of the drill holes, with the result that the shaft was flooded again.

After some trouble, the shaft was unwatered, only to be flooded three times more in as many weeks. Nearly all this water came in through bore holes that were probably in no case over two inches in diameter. When the fifth unwatering had been completed, the conditions below were known to forbid further progress without taking special precautions. In fact, it had been ascertained that there

produced a clogging effect. Some grout was wasted, but success was eventually obtained. In this procedure, a total of 2900 bags of portland cement was consumed. When the grout had hardened in the crevices, a few more holes were drilled, and water having a head of 65 lb. was found 14 ft. below. These holes were soon grouted up, only 60 bags of cement being required.

Sinking was not at once resumed, however. It was deemed advisable to deal further with the question of the water. The Shawangunk grit was now about 100 ft. further down, and it was proposed to grout up the intervening water-bearing strata. Accordingly, six diamond-drill holes were put down to the grit; half were of the size corresponding to a 1-in. core; and half corresponding to a 2-in. core. With a pres-

Use of Grout in Shaft Sinking

R. C. Johnson calls attention to an error made in publishing his article "Use of Grout in Shaft Sinking," in COAL AGE of Feb. 24. On page 641 the phrase reading "200 gal. of water per hour" should be "200 gal. per minute." It will be noted that this puts a somewhat more favorable aspect on the possibilities of the scheme in question.

In order to avoid accidents, drivers should ride on the front end of cars on a downgrade. The practice of riding between cars should be prohibited, also the dangerous habit of sitting on front bumpers and allowing the feet to drag over the rails.

Another Explosion Test at Bruceton

Editorial Correspondence

On Saturday, Feb. 24, at noon, the Bureau of Mines conducted an experimental dust explosion in the federal mine at Bruceton, Penn. The arrangements for the test were under the direction of Chief Engineer George S. Rice. The mine was exploded without mishap or delay and the results were gratifying.

At 7:30 o'clock Saturday morning, the government engineers, accompanied by invited guests, left Pittsburg on a Baltimore and Ohio train arriving at the mine, 14 miles out of the city, before 9 o'clock. The forenoon was spent by those present in examining the mine and observing the arrangement of the experimental recording machines. Every detail of the

This most recent experiment conducted by the engineers of the Bureau of Mines resulted in furnishing quite satisfactory proof that a stonedust barrier will stifle the flame of an explosion and prevent disaster spreading through the entire workings of a mine. Also interesting notes on flame velocity and maximum explosion pressure.

the maximum pressure of the explosion. In order to determine the velocity of the flame, each station is equipped with a circuit-breaker, consisting of a strip of tin foil, which latter is so arranged that it is readily melted by the heat of the explosion. After the tin foil is melted and the circuit is broken, a commutator switch comes into play, and a mark is recorded on a chronograph located in the recording station just above the mine and about 800 ft. distant.

The records of pressure are secured by means of a crusher manometer, which instrument has been adapted from similar instruments that are now used by the U. S. Navy in determining the maximum



STEEL GALLERY IN THE FOREGROUND. THE SMALLER HOUSE ON THE RIGHT NEAR SIDE PORTAL SHELTERS FAN AND IS UNINJURED. A BODY OF FLAME AND SMOKE IS SEEN ESCAPING FROM MAIN PORTAL IN REAR

preliminary preparation was carefully explained by the representatives of the mining bureau.

The accompanying sketch shows a rough plan of the mine and the location of the seven recording stations. The first two stations which are shown on the left side of the main entry looking into

the mine, have been practically completed and are larger and better equipped than the other five stations located on the right side of this same main entry.

THE RECORDING INSTRUMENTS

The principal data sought by the Bureau of Mines were the flame speed, and

pressure of big guns. These manometers are also connected with the magnet of a recording chronograph.

The chief defect in the system, as at present arranged, is that the testing apparatus situated in each of the seven stations, is so connected in series that in case one of the stations fails to record,

all the remaining stations on the way out also fail to furnish a record. It seems that this can be avoided and I understand it is the intention of the Bureau engineers to remedy this fault by having a separate chronograph for each station, or by having the drum on the chronograph wide enough so that an individual record for each station can be secured.

GAS SAMPLERS

In addition to the recording instruments just described, the mine was equipped with a British coal gas sampler, and two gas samplers built in the experimental station at Pittsburg. The principle on which all these gas collectors work is based on the suction idea, and is expected to furnish the experimenters with a true sample of the afterdamp that follows an explosion.

The gas sampler built by Mr. Burrell at the Pittsburg station, is a simple apparatus consisting of a gas cylinder identical with those fitted on oxygen breathing apparatus, and supplied with a glass bottle and an automatic valve. The



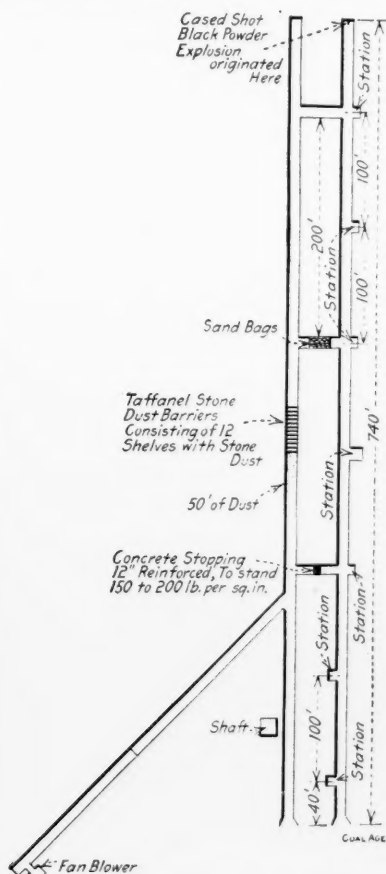
J. W. BOILEAU, COAL EXPERT, AND A. C. BEESON, CHIEF ENGINEER PITTSBURG-BUFFALO CO., GETTING A HANDOUT AFTER THE EXPLOSION

gas cylinder is so arranged that a vacuum exists inside and the force of the explosion as it passes, breaks the glass bottle fitted to one end of the cylinder, afterdamp rushes into the tank, automatically closing a valve and thereby confining itself. These samples are only in the experimental stage and as yet have not been perfected or proved.

THE STONE-DUST BARRIER

Possibly the most interesting result of this test was the action of the Taffanel stone-dust barrier that was located on the airway between the first and second crosscuts. (See sketch.) This barrier consisted of twelve shelves, on which

stone-dust was piled. It is a fact that when the explosion occurred, no flame was seen to escape from the steel gallery that leads off from the air course to the fan. The accompanying photograph of the explosion, is rather convincing proof that the barrier stopped the flame. Practically no smoke is coming from the steel gallery while the smoke, dust and gas is seen belching from the mouth of the main entry. An examination after the explosion had occurred showed that the coal dust just inside the stone-dust barrier had been coked and that the dust placed on the outbye side of the barrier showed no signs of having been fired.



ROUGH PLAN OF BRUCETON MINE, SHOWING LOCATION OF RECORDING STATIONS, STONE-DUST BARRIER AND CONCRETE STOPPING

This is not certain proof of the efficiency of the stone-dust barrier, but is fairly good evidence that stone dust may be useful in preventing the spread of a dust explosion.

The sand bags, placed in the second crosscut, were partly dislodged. The 12-in., reinforced-concrete stopping, located in the first crosscut, and designed to withstand a pressure of from 150 to 200 lb. per sq.in., was not injured. However, a stopping of this type and having no greater width, we believe could hardly withstand the pressure accompanying an explosion originating in a large mine and traveling a longer distance.

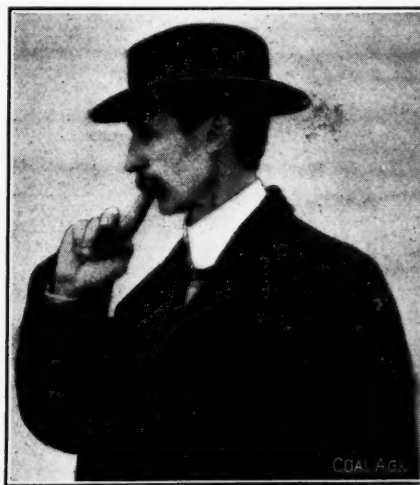
In the explosion set off at this same

mine last fall, only 1 lb. of coal dust was used for each lineal foot of entry length. In this most recent test, 2 lb. of coal dust were used in each foot of entry charged. It is evident, therefore, that in this latter case, the coal dust was in considerable excess and that is a probable reason why there was so little flame emitted from the mouth of the main entry.

RESULTS OBTAINED

It is the purpose of the Bureau of Mines to issue a bulletin giving the results of observations obtained at the test. In advance of final and complete information, we are permitted to say that the recording instruments showed a probable pressure of from 150 to 200 lb. per sq.in. The flame velocity was approximately 2000 ft. per sec. Only 4 of the stations recorded.

That this test was directed along proper lines and is a step in the direction that will net valuable results, no observer present at the explosion can doubt. Personally, I was most interested in the action of the stone-dust barrier. I feel sure that if I was in charge of a dangerous



SNAPSHOT OF J. A. HOLMES—TAKEN AT THE INSTANT THE SWITCH WAS THROWN IN TO FIRE THE SHOT AT COAL FACE

mine tomorrow, I would install stone-dust barriers at selected points, without waiting for any more definite results.

The flame velocity and especially the maximum explosion pressure are good things to know so that we can properly gage the size and strength of air-stoppings; however, next to the seemingly satisfactory action of the stone-dust barrier, the matter of greatest interest was the change in the amount of coal dust used, and the altered character of the explosion. I did not see the first explosion, but am told that this initial test showed more flame, undoubtedly due to the fact that the coal dust present (1 lb. per lineal ft.) was nearer the maximum explosive limit.

A Retort Coke Quencher and Loader

By A. Goodall*

For many years efforts have been made to reduce the cost of handling coke as discharged from retort coke ovens. Various forms of benchwork have been devised, and several kinds of mechanical apparatus tried.

The problem is not altogether easy, because of the variety of conditions to be met. The coke must be quenched as it leaves the ovens, or it will damage the railway cars, but it must not be quenched to such an extent that it contains a large percentage of moisture. The breeze and small must be removed before loading, and there must be facilities for loading anywhere along the entire length of the bench, or beyond if required.

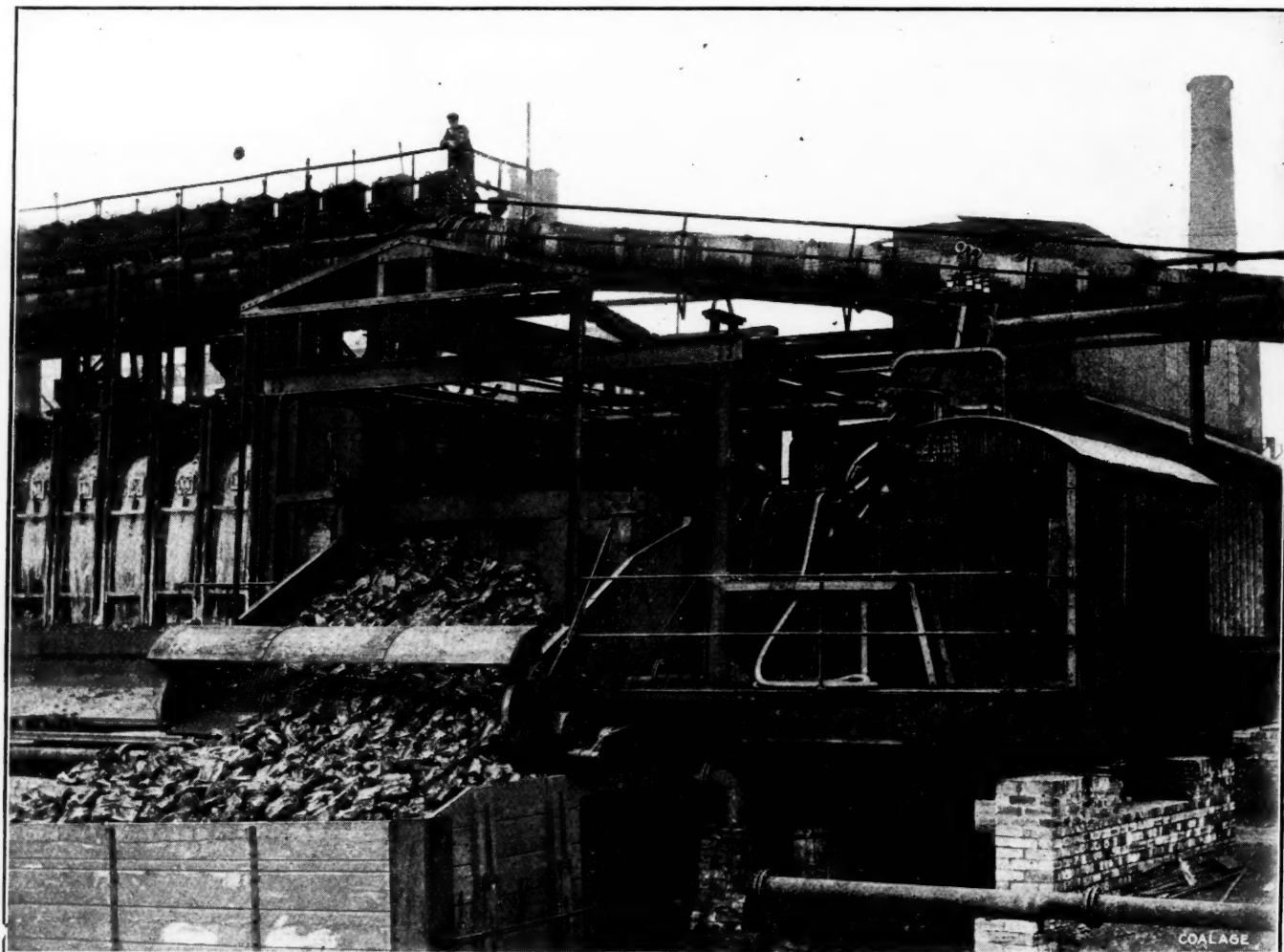
Description of an apparatus for quenching and loading coke from retort ovens in one operation. A number of plants are in successful operation in England and it is claimed the machine will effect a considerable economy in labor.

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ing of quite two-thirds of the labor usually expended in performing the same operations by other methods.

frame there is a footstep bearing, and at a reasonable diameter a ring of rollers for carrying a revolving horizontal table, which is of strong construction, and covered with cast-iron perforated plates.

This table is surrounded with a ring of plates fixed to the frame and having cast-iron lining plates which are renewable. There is a slot or opening with guide plates, in this ring opposite the center for guiding the coke on to the table; this is of cast-iron and so constructed as to form a quenching box or hood. This box has slots in the sides through which the water from perforated pipes sprays on to the hot coke, as it leaves the oven and before it reaches the revolving table.



MACHINE DISCHARGING COKE IN RAILROAD CARS

The problem would be simplified if a car could always be placed opposite the particular oven to be discharged. This cannot be done in the ordinary course of working without much cost and inconvenience. Goodall's Patent Coke Quenching, Screening and Loading Machine has been designed to meet all these conditions, and in practice shows a sav-

DESCRIPTION OF THE MACHINE

The machine consists of a large frame running on wheels on rails placed in the position usually occupied by the bench or quenching floor. The frame carries the motor and gearing to propel the machine along the rails in either direction and to revolve the table and drive the shaking screen. On the center of the

Directly opposite this opening, there is a large door in the casing. This door is controlled by a winch in such a manner, that when the door is closed the inside of the casing is a complete ring, but when opened, the door projects inwards and acts as a scraper or ejector in removing the coke from the table as the table is revolved. The *modus*

operandi is clearly shown in the accompanying sketch, which shows the door open ready to discharge the coke.

CONSTRUCTION OF MACHINE

Under this opening, or doorway is arranged a shaking screen, fixed at such a working slope that the coke as it is ejected from the table, is effectively screened, and passes therefrom into the car. A receptacle or hopper below the screen receives the screenings and can be emptied into the breeze car as required. Moreover the breeze can be further separated from the small, where there is a sale for such. In addition to the quenching hood, there is arranged above the revolving table, pipes to further quench the coke as it lays on the table and a small hose for spraying any odd pieces of hot coke, is also provided, thus ensuring the coke being properly and effectively quenched.

The revolving table is constructed of mild steel girders thoroughly braced and

being steel and mostly machine-cut. The travelling wheels are manganese steel and are in pairs on the Bogie principle, two of these being driven direct by means of spur-gearing. The whole of the gearing and opening platform is enclosed in a corrugated iron cabin and the machine is fully equipped with switches for power and light, lightning arrestors, controller, resistance, etc., for the proper and economical working during all hours. From tests that have been made, it has been found that the power required to deal with a charge of 7 tons of coke, was equal to 2.52 kilowatt-hours.

METHOD OF WORKING

The method of working the machine is as follows. The machine is propelled along the rails, and the slot or quenching hood is brought opposite the oven to be discharged. The oven door is now removed and the pushing of the oven commences. When the nose or front part

the oven to allow the oven door to be reset and the oven to be recharged without waste of time and loss of heat. After a reasonable time for steaming and drying, the coke is ready for loading into cars. All surplus water and dirt drains away immediately through the perforations in the floor plates of table, and so avoids over saturation of the coke.

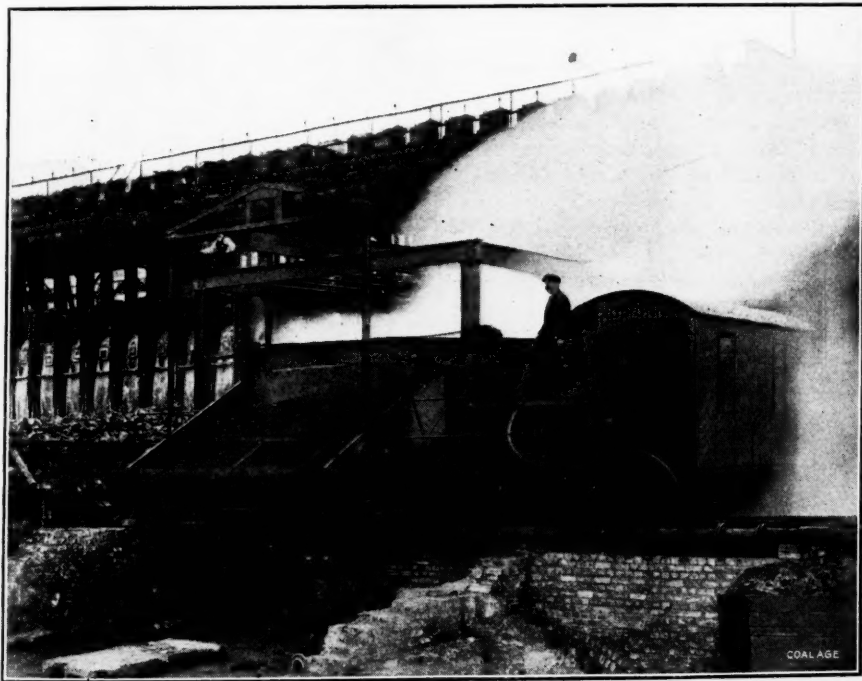
The machine is now propelled to the car, or other receptacle which requires loading, either along the front or beyond the battery of ovens. The table is revolved in the required direction and the discharging door or ejector operated by the hand winch, by which means the coke is gradually fed on to the screen, and so on into the car. The small coke is received in a hopper under the screen which is emptied into a car placed in any convenient position, as required.

OPERATING COSTS.

The same operation is repeated, as the ovens are burnt off and it has been found by practice, that one machine can effectively deal with 60 ovens and that the coke is put into cars in the best marketable condition.

These machines are in successful operation at a number of large plants in England.

The cost of operating the first machine installed as against handling the coke



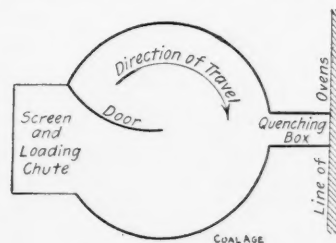
QUENCHING THE COKE PREPARATORY TO LOADING

riveted together and carrying perforated cast-iron floor plates. The mild steel plates forming the case round the outside of the revolving table are lined with cast-iron plates so that with the exception of the screen plates all the wearing surface which comes into contact with the coke is of cast-iron.

The machine is driven by a 20-hp. motor, or it can, if required be fitted with a steam engine and boiler where electric power is not available. The different speeds for propelling the machine along the track, the revolving of the table, and the operating of the screen are obtained by worm- and spur-gearing all enclosed in suitable gear boxes, the main gearing

of the cake of coke has entered the quenching hood, the valve controlling the water supply to the hood is opened, and the water sprays on both sides and the top of the coke, during the time it is travelling through the hood. In the meantime, as soon as the coke has entered on the table a short distance, it is revolved, and by this revolving of the table, the bottom part of the coke is carried away as it were, and gently and evenly distributed over the table.

The coke if required, can be further quenched by means of the perforated pipes above the table. Immediately the ram or pushing rod is withdrawn, the machine is removed from the front of



METHOD OF OPERATING

by the usual methods, at the Weardale Steel, Coal & Coke Co.'s plant at Spennymoor, England was 3.88c. against 15.23c. per ton; these figures are the average obtained from about 7 months operation. The cost of repairs to three of the Weardale Co.'s machines during a period of four weeks where 14,000 tons of coke were handled was \$28.43 which includes both labor and material.

These come out most favorable owing to the plain and simple construction, and the few moving parts which are also of slow motion, large in size and heavy in design.

Further in the case of new ovens, a great deal of costly work in the building of the quenching floors, can be saved by the use of this machine. Indeed it might well be, that the saving in the floor alone would pay for the machine in new installations. There is also the advantage that the whole of the quenching, screening and loading is carried out at one operation.

Current Coal Literature

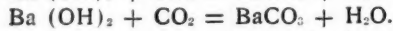
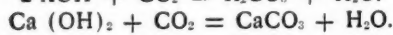
The Best Thought Culled from Contemporary Technical Journals, Domestic and Foreign

Tests for Carbon Dioxide

The following is an extract of a paper written by T. Bryson for the *Colliery Guardian*, of London, England:

"For the estimation of carbon dioxide little or no knowledge of chemistry is required, when a suitable method of analysis is adopted. The principle of the usual methods is that of producing carbonates by the action of carbon dioxide on the hydroxides of alkali metals.

"The formation of carbonates by the action of carbon dioxide upon the hydroxides may be illustrated by the following equations:



"The first of these changes is the one that takes place when carbon dioxide is

consequently, an apparatus such as Dr. Angus Smith's may be used.

"The outfit required for this test consists of one 8-oz. ground-glass stoppered bottle, one 5-oz. ditto, four 1/2-oz. bottles with corks, one 1/2-oz. pipette, and a hand bellows or piece of rubber tubing for taking samples of air. A supply of lime water of decinormal strength, colored by the addition of a little of some suitable end-point indicator, completes the outfit.

"To make a test the small bottles are filled with the colored solution, and a sample of mine air is charged into the 8-oz. bottle, by means of the hand bellows, or sucked into the bottle by the observer, who uses the rubber tubing in the manner shown in Fig. 1.

"When the sample has been obtained the contents of one small 1/2-oz. bottle is emptied carefully into the bottle containing the air to be tested. If the solution is decolorized, the air in the bottle contains over 1/4 per cent. of CO₂. By using all four bottles of lime water, an approximate test up to 1 per cent. may be made, and, fortunately, this number is rarely exceeded in testing air from mines of today.

"Lunge's test is one by which a much closer approximation to the actual amount of carbon dioxide in the air may be obtained, and it requires a person using it to have a little more knowledge of physics and chemistry than the last test, but nothing more than is usually obtained by attendance in a class in physics and chemistry of mining.

"Fig. 2 illustrates the apparatus, which consists of a rubber bulb of known volume (= 60 cc.), and a 5-oz. bottle with the necessary fittings of tubes and cork. The solution, in this case, is a decinormal solution of barium hydroxide, to which are added a few drops of phenolphthalein, for the purpose of indicating the end-point in the reaction between the CO₂ and the Ba(OH)₂.

"To prepare the apparatus for the test, 48 cc. of distilled water and 2 cc. of decinormal Ba(OH)₂ are put into the bottle, the bulb is compressed and the cork adjusted. The bulb is now allowed to fill and then it is slowly compressed to pass the air being tested through the solution, which becomes decolorized when the required amount of CO₂ has been passed through. The number of compressions are noted, so that the volume of air can be calculated. To neutralize the Ba(OH)₂, according to the law of defin-

ite proportions and the equation already stated, 0.0091 gram of CO₂ will be required. The volume of this weight of CO₂ is calculated at normal pressure and temperature and corrected for changes of pressure and temperature, after which the percentage of CO₂ in the air being tested

$$= \frac{\text{volume of CO}_2}{\text{volume of air}} \times 100$$

In examining the air of a particular mine periodically, there will be no need to make the slightest calculation after, say, three or four tests have been made and the results plotted in square paper. It would only be necessary to note the number of compressions required and consult the graph to obtain the percentage of CO₂."

For those whose knowledge of analytical chemistry is slight, it may be stated that a normal strength of lime water is 28 grams of lime (CaO) per liter, whereas a barium hydroxide solution of normal

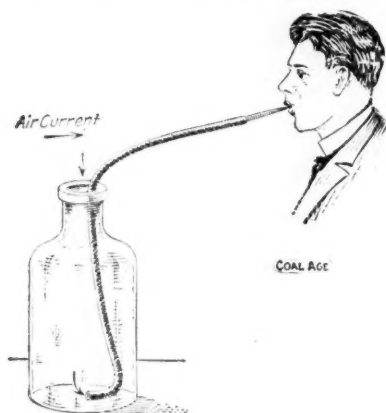


FIG. 1. FILLING BOTTLE FOR ANGUS SMITH CARBON-DIOXIDE TEST

absorbed by potassium hydroxide in such appliances as Dr. Haldane's, Hempel's, Orsat's and Bunte's. The second is the change which takes place in Dr. Angus Smith's apparatus when CO₂ is absorbed by a decinormal solution of lime water, and the third equation illustrates the change which takes place when mine air containing carbon dioxide is passed through a solution of barium hydroxide, as in Lunge's apparatus.

"Any of the above methods may be adopted for the estimation of CO₂, but since the form of an apparatus and the space occupied by it are of such importance in mining, several of the appliances are only suitable for laboratory purposes, and only a few are of any use underground.

"In mining it is not absolutely necessary that carbon dioxide should be estimated to a great degree of accuracy, and,

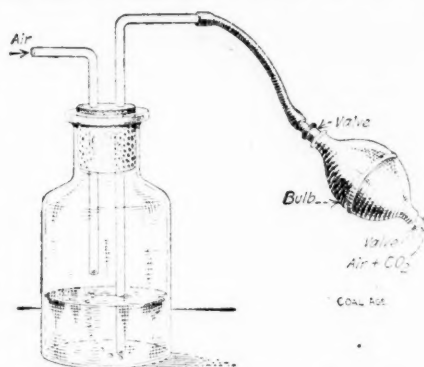


FIG. 2. PASSING MEASURED AIR INTO BOTTLE—LUNGE TEST

strength would contain 85.7 grams of the metallic alkali per liter. Decinormal solutions would, of course, be one-tenth as strongly concentrated. The end-point indicator is a chemical which will change its color when the solution in which it is dissolved changes its condition from alkalinity to acidity, or vice versa.

Precautions in Dry Mines

In his annual report for 1911, George Blacker, of inspection district No. 1, Wyoming, gives the following notes on fire protection in the dry mines of that state where stoppings frequently inflame:

"A source of danger requiring attention is the careless practice, in which miners indulge, of allowing their powder cans to lie where they are exposed to naked lamps and the sparks which fly from the same. The mine foremen are

likewise blamable for this condition of affairs and should insist when hiring a miner that one of the conditions of his employment shall be that he use a box in which to keep his powder, paper and squibs. I observe with much satisfaction that in Rock Springs, all such boxes are being covered with tin, and rendered impervious to fire.

I am pleased to note a steady increase in promoting safety from fires, which in the past have wrought havoc in coal mines throughout the country. The air bridges, when constructed of wood, are being incased with sheet iron and made as nearly fireproof as possible, and the newer ones are being built of concrete."

STRONG VS. WEAK STOPPINGS

Mr. Blacker is a strong advocate of indestructible stoppings, as will be seen in the following extract. The question, however, is not so simple as he regards it. Weak stoppings allow the lateral extension of an explosion and permit the spread of the gaseous products of combustion along unforeseen channels. However, the existence of strong stoppings favors the extension of the explosion along the airways and leaves the ventilation unimpaired, thus the vitiated air spreads from the seat of the catastrophe as far as the current travels. It may be pointed out that where the explosive violence is not hedged in by strong stoppings on either side, the force of it is reduced, the coal dust or which it feeds tends to fall and the temperature of the blast is reduced by the large quantities of cool air with which it is admixed. Thus the travel of the explosion is shortened. The subject is an open one and the following note expresses Mr. Blacker's convictions on the matter:

"It is high time that the antiquated methods heretofore employed in the building of stoppings with common boards, wood blocks, boney, brick and stone, or any material which will burn or be blown out, be abandoned, and that modern methods be applied which are free from any of these objections. An explosion is rarely general, that is, its force rarely extends to all sections of the mine, then why is it that the miners working in that portion of the mine which is not affected by the force of the explosion, are suffocated? Is it not because the stoppings are too frail to withstand the force of the explosion and are therefore blown out, and before they can be rebuilt, even temporarily, and the current partially restored, the deadly afterdamp like an assassin, waylays and destroys the miners. This being true, as all must admit who are familiar with scenes in the mine after an explosion, then what is to be thought of the management of those who are directly in charge of such a mine, who see stoppings blown out like paper

by an explosion and the deaths of scores of men far away from the point where the blast originated or extended and who nevertheless will immediately rebuild those stoppings in the same manner as formerly? Does not such an action seem like a crime?"

Explosions

Speaking on "Some Coal-dust Explosion Problems," James Ashworth, of Vancouver, Can., at a recent meeting of the South Wales Institute of Engineers, made the following remarks, which it may be anticipated will not meet with general approval, as he himself regretfully admits.

"Experiments and the demonstrated facts of colliery explosions, have led me to conclude that it is the fresh dust largely produced from the attrition of coal during transit, which is the most dangerous element in the origination and propagation of an explosion in a modern coal mine, and also that no pioneering cloud of dust is required, except to extinguish the flame. For some years I have held the opinion that this new dust, just as fast as it is produced, is floated away in its own balloon of gas; that this is its actual condition was practically demonstrated by Prof. Phillips Bedson's experiments. These proved that the gas content of each particle of coal was greater than the cubic contents of the particle, and therefore that the gas was under pressure. Consequently when exposed to the air, the coal dust more or less quickly dissipates its store.

FRESH VS. OLD DUST

Again, to quote Prof. Bedson, when a particle of coal dust has exhausted its occluded gases, these are principally replaced by oxygen, because the nitrogen is filtered out by the smallness of the pores of the coal dust, and, as the resulting oxidation makes the dust heavier, it thus naturally settles on the timbers and the rough sides of the roadways of the mine. This course of reasoning brings me to the conclusion that the principal factor in a coal-dust explosion is the gas escaping from the coal dust floating in the air, while the dust itself is but a secondary cause. The dust on the roadways and the "pioneering" cloud of dust take a secondary place, and are the great source of the large volumes of carbon monoxide which are formed in every explosion of a coal mine.

There is another phase of the subject, in which I have so far had little support from other students of explosive phenomena—viz., demonstrations of detonation and percussion. At Altofts there were at least three demonstrations of enormous force, and the records published may be searched through without any explanation being found, and it would appear as

if no special value has been attached to these occurrences. I refer to Nos. 13, 21 and 25. In the case of No. 13, two lengths of sectional boilers, each 15 ft. in length, were blown to pieces, the bottom parts being completely flattened out. The most important point to note is that this "burst" was not at the end of the gallery, but 60 ft. back from the end (the downcast). Experiment No. 21 produced a still more noticeable feature, viz., of an explosion within an explosion outside the end of the downcast. Why an explosion within an explosion? In experiment No. 25, three lengths of boiler shell were literally torn to pieces, and again there was the flattening of the bottom plates. The end boiler shell was not torn to pieces, and the effect was in this respect similar to No. 13. Were not all these effects demonstrations of detonation? If the force were not caused by detonation, what caused the noise to be heard at a distance of seven miles?

NO CURE BUT CARE

Assuming that it is proved that detonation or percussion may be a feature of any modern colliery explosion, it then follows that zones, whether of water or stone dust, are not of the least practical value. Watering by sprays or otherwise and dampening by steam is perfectly useless as a means to control the extension of an explosion after it is once initiated, and are only useful for sanitary purposes. I believe a dry mine to be safer in every way than a damp one, and that an excess of dust will smother out an explosive flame. The experiments which have been made for the purpose of proving that stone dust could restrict the extent of an explosion are entirely misleading to this extent, viz., that they have not been made under conditions representing a roadway in a mine where, under normal conditions, the air is carrying along its regular quota of the finest and freshest dust, and which is being continuously produced. This dust alone is calculated to carry an explosive flame over a stone-dust zone. In conclusion, as neither a stone-dust nor a watered zone can restrain a detonative or percussive effect, it follows, in my opinion, that at the present time there is no known means of controlling the extent of an explosion, except by preventing its initiation."

It might be added to Mr. Ashworth's remarks, the statement that he has for many years been of the opinion that a fall of rock could generate an explosion of coal dust simply by the air compression which it would cause. He does not regard it as necessary that the extension of an explosion shall be limited by the travel of the flame or of the heated products, but views it as possible that compression, percussion and detonation may extend the explosion from many disconnected centers.

Who's Who—in Coal Mining

Devoted to Brief Sketches of Prominent Men, Their Work and Ideas

Nine times out of ten the character of the chip is largely determined by the soundness of the block from which it is cut. According to such reasoning, it is easy to understand why John H. Jones has sufficient business acumen to justify the Pittsburg-Buffalo company in carrying a million dollar policy on his life.

While the four Jones brothers, John, Tom, Dave and Harry, have stuck close to their knitting and not only cornered "Miss Opportunity," every chance, but handcuffed the old lady, whenever she ventured near, there's no gainsaying the fact that "Daddy" Jones, father of them all, built the body of the ship and headed her nose toward the Island of Promise. And while the old vessel wasn't an ocean greyhound, she had a steady keel and was mighty seaworthy.

Half the energy of life is wasted in not knowing which way to steer first, and the fact that the Jones boys had their compass set and their early course mapped for them, made the going a bit easier, but it shouldn't detract from their proved skill as navigators in a squally sea. Furthermore, there's a lot of people who can convert a sailing vessel into a fishing smack, but only a few who can make a turbiner out of the same old ship.

If James Jones, founder of the business success of the present family, had any two qualities o'ertopping all other virtues, they were *energy* and *perseverance*. These two attributes of character can accomplish much without talent, but the latter can do no more without them than an engine without steam. However, the elder Jones had ability as well, and the common sense to concentrate these essentials on one unwavering aim.

From that day, back in 1858, when "Daddy" Jones landed in New York, there is no evidence to prove that he knows how to go backward. Starting first at Frostburg, Md., he arrived shortly after at Pittsburg, where he secured employment as a blacksmith. This work was followed by a change to mining, which occupation was pursued until his retirement from active business a few years ago.

In the meantime, while the elder Jones had been building and enlarging his interests, John H. had busily occupied himself in making good on his own account. At 10 years of age he worked in and around the mines, and at thirteen, he left school and took charge of shipping and loading coal at his father's properties.

At sixteen, young Jones returned to

school, but he was soon in harness again, and the following year filled the position of mine boss at his father's colliery. Upon the formation of the Catsburg Coal Co., by his father, John H. was elected secretary, treasurer and general manager. About this same time he went into business for himself, shipping coal to Cincinnati, New Orleans and other river points. He also secured an interest in the Rostraver, Ivill and Catsburg Coal Companies, acting as general sales agent for all these concerns while still handling his own business.

In 1896 when "Daddy" Jones consolidated with the boys, and also took over other properties, the interests of John formed no small part of the new company, and he was appointed manager of



the combined operations. In 1899, the Jones interests were sold to the Monongahela River Consolidated Coal and Coke Co., and the four Jones brothers devoted themselves to the incorporation of the Pittsburg-Buffalo Co., electing John H. president.

Mr. Jones is also president and a large stockholder of the Federal National Bank in Pittsburg. He is vice-president and director in the American Sewer Pipe Co., director in the National Fire Proofing Co., and many other financial and industrial institutions. His home life is ideal, and when the day's work is finished, you'll find John H. on his magnificent estate at Johnetta, Penn., riding a favorite horse

or chumming with the kids. If I wasn't the son of my own father, I would rather be that of John H. Jones than any one else I know.

There are many sidelights on the character of this man, but three things appear to me to stand out most prominently. First, there is concentrated energy, coupled with decision and promptness of execution. Every movement indicates the man alert. When John begins to move, and that's pretty much all the time, something commences to happen. There's no fuel burned up in unnecessary switching.

A second quality that John H. has developed to overflowing measure, is tact, the open eye and very life of the five senses. It has enabled him to cut all the knots he couldn't untie, and has permitted his performing disagreeable duties after robbing them of their sting. Talent is weight, tact is momentum; the former is inherited, the latter can be acquired. In the case of our friend John, we are inclined to the belief that his pleasing manner is an acquisition of his personal getting. "Daddy" Jones was of the old school. His son is of the new type of business leader. The sort of man that causes the unsophisticated to believe that all you have got to do is to hold out your hat to him, and it will be filled with gold. But here's a tip: Don't spend any money you're going to filch from John H. Jones until you've delivered the goods, had them O.K'd, and the coin is in the bank.

In closing this sketch, I must mention a third characteristic of our subject, and that's loyalty to a purpose or a friend. The exercise of this quality begins in his home and extends to the limits of his business. Its Tom, Dave, Harry, John H., Jr., and the whole family that Mr. Jones is plugging for, rather than for the President of the Pittsburg-Buffalo Company.

His employees are next to him in kin, and when asked what line he wants his boy to follow, you'll get one reply: "I want him to devote himself to the betterment of our men; the building of more comfortable houses; the beautifying of our mining towns and the provision of sanitary and more enjoyable surroundings." He has never forgotten the hours of labor spent underground and on the wall of his office is his fireboss certificate dated Feb. 7, 1888, and issued to him when he was 21. It's his close contact with the men and their work, that has enabled him to develop mines that are considered the model operations of this country.

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This journal has a direct aim—a single purpose—which is to help advance the coal-mining industry. Its creed embodies the dissemination of knowledge and the free interchange of ideas among its readers, all of whom are invited to become regular contributors.

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COAL AGE

Afterdamp

Not long ago, Jan. 6, we had occasion to comment on a definition recently substituted for the original meaning of blackdamp. A misrepresentation of the meaning of the word "afterdamp" is almost as common. For a long time there has been a tendency to make afterdamp merely the unscientific appellation of carbon monoxide; the former word meaning if it means anything, the mine air after an explosion.

We are by no means clear what afterdamp really contains. Nor will we get close to its real constituents so long as we continue to collect it for examination by pouring water out of flasks and permitting the mine air to enter in its place.

Perhaps we will never know by taking samples after a mine explosion what gases are created in such disasters. And for this reason; that it is probable, even likely, that a large portion of the gases may be soluble distillates resulting from the heat of the blast. These dissolve with rapidity and are precipitated. One large resultant product of an explosion is water. The hydrogen of the methane unites with the oxygen of the air so that water vapor is formed. This is the vehicle through which eventually the soluble distillates will be deposited on the roof, walls and floor of the mine as soon as the temperature has been reduced sufficiently to make such an action possible.

It is probable, therefore, that he who would make such a determination must be on the ground shortly after the disaster, and the way to find the true resultants of such a conflagration is by an experiment, in laboratory or mine, the product being collected not by displacement of natural water, but of some other fluid which does not dissolve the gases—mercury for instance.

It has been suggested that by the use of two water flasks connected by a siphon, a more correct approximation might be obtained than with a single flask. By raising the sampling bottle,

the water passes to the other and the first bottle is filled with air. By lowering it below the second bottle, it is filled with water and the air is expelled. These actions frequently repeated will saturate the water with soluble gases, and if the temperature and pressure of the water is not changed, this fully saturated fluid will permit eventually of the taking of a sample of air, which will represent the more soluble constituents of the air as well as the less soluble. But this process is slow, time presses in taking such a sample and perhaps a non-absorbent liquid would serve the purpose better.

It has been noted that water dissolves and glass absorbs carbon monoxide. We may overlook these absorbencies, but not the solubilities of ammonia, hydric sulphide, sulphur and carbon dioxides and nitrous oxide. K. B. Lehmann states that exposure to 0.25 to 0.45 per cent. of ammonia causes illness and danger to life in from a half hour to an hour; 0.1 to 0.2 per cent. of hydrogen sulphide causes rapid death, while 0.05 to 0.07 per cent. will cause illness and possible death within an hour; 0.04 to 0.05 per cent. of sulphur dioxide is equally distressing within a like period. These bodies are very soluble in water. At the temperature of the mines, water will dissolve about 1000 volumes of ammonia, four volumes of hydric sulphide, 67 volumes of sulphur dioxide, 1½ volumes of carbon dioxide and one volume of nitrous oxide.

From these statements it will be seen that highly important gases may exist in afterdamp outside of what are commonly called higher hydrocarbons, and these are not unlikely to evade collection by the current methods. The higher hydrocarbons, and perhaps the bisulphide of carbon, are possibly other causes of toxic action.

Afterdamp is sometimes termed "choke-damp", because it causes choking. This spasm of the windpipe is probably due to the presence of other gases than the monoxide and dioxide of carbon.

We are told that a wet rag is of avail to keep out afterdamp, yet there has been published in COAL AGE an article (Dec. 23, 1911) to show of what little avail it may be in keeping back the simpler compounds of carbon. At best, the rag would absorb its fill of carbon dioxide in $3\frac{1}{2}$ sec. and its possible monoxide retent in less than one second. Nevertheless it is generally thought that the wet rag is of value. Perhaps the reason for its efficiency is to be found in the fact that among the compounds it excludes may be unrecognized bodies of highly dangerous character and great solubility.

In a recent article, Edwin A. Chance (Jan. 27) said that: "A case has been reported in which several men lost their lives on entering an atmosphere containing 0.0023 per cent. of monoxide and 4.874 per cent. of carbon dioxide. The oxygen percentage was not stated." He ascribes their death to the combined effect of the two gases. Would it be unreasonable to inquire whether it was not due to a third or to a combination of many toxic gases? In fact, if the gas was collected as Mr. Chance advocates in our issue of Dec. 30, what chance was there that any higher soluble gases would be apparent in the analysis, which by the way appears to have been a somewhat incomplete one?

If we continue to have faith in the dampened rag and conclude that explosion products have the contents generally claimed, then indeed we must assume a "dialysing" action in the wet rag, or that the rag caused a remarkable reduction in breathing, or that some other action existed, the nature of which all orthodox chemists will deny.

We would not be dogmatic and assert that the arguments given are absolutely conclusive, but they open a field for investigation and bid us beware of thinking that the true afterdamp is the insoluble residue of the air after an explosion.

Coal Dust Heterodoxies

We print this week in our Current Coal Literature, the interesting remarks of James Ashworth, on the explosion of coal dust. And this we do because we are advocates of an open forum, because no shade of opinion which might conceivably be right should be suppressed by

any public organ till that opinion has been heard and duly weighed.

There is little need to decry the gaseous skin or pellicle theory which Mr. Ashworth restates, because this theory of the cause of an explosion was discussed in full in our editorial on "Methane in Coal Dust Explosions," contained in the issue of Feb. 17. What little show of validity may possibly clothe this consideration is of little use in assisting to bolster up a detonation theory, with which he concludes his remarks, and perhaps Mr. Ashworth regards the two alleged phenomena as without bearing, the one on the other. If coal dust can be detonated, what need is there to show the presence of a methanized envelope around each particle?

But, perhaps, it might be well, here and now, to point out that if a skin coat of gas is to be found on every particle of recently formed coal dust, and if that coat is the cause of dust explosions, then why is it that flour and lycopodium ignite with such explosive violence? Are these also enveloped in like pellicles of explosive gas?

The pellicle theory, here held to be a heterodoxy, is of different character to that theory largely, and we believe not unreasonably, held: That all solid hydrocarbons—coal, cotton, flour or lycopodium—are not in themselves explosive and that the gas alone given off by them when they are exposed to heat is the source of the violence which accompanies combustion. This is another proposition, a hard one to combat and a hard one to prove; with it we have no quarrel and for it no valid defense. At present writing it is a theory unproved but inherently likely.

The theory of detonation advanced by Mr. Ashworth is interesting and doubtless original with him. It has been found that detonating substances contain within them enough or almost enough of such elements as would permit of complete internal combustion. Detonation causes an atomic loosening, whereby elements contained in the unstable compound are freed instantaneously. They are then able to combine at once with other elements, also just freed, the mutually attracted elements being intimately disseminated within the detonating body. But Mr. Ashworth says that coal dust detonates. We do not believe that he is of

the opinion that a molecular rearrangement takes place *within* the coal particles, but that molecular combinations take place with the external air of such a violent nature that "detonation" will rightly be applied to them. An internal detonation could not be the result of combination with oxygen, the most usual action of detonating bodies, because within the coal particle not much oxygen is to be found. Moreover, Mr. Ashworth is of the opinion, as are most theorizers, that stale dust, though more thoroughly impregnated with oxygen, is less explosive than the dust which is fresh. We do not know the nature of the detonation he would hypothecate. Whichever it may be, there may be such a detonation, but probabilities do not favor it.

Such unstable theories are used by Mr. Ashworth to back his statement that sprinkling and the use of steam are alike of no value. An assumption such as this, hard as it is to prove true, should not be permitted to sweep aside clear knowledge that moistening is of advantage. We are not clear, however, to what extent moistening can be perfected nor are we sure of the scope of its ability to immunize, but that it is of value and to be pursued in all mines where the temperature is not excessive and the roof not affected, is our firm and unwavering conviction.

The Death Toll of Mining

We have to dig so many million tons of coal every year to keep our mills and factories running, to heat and light our houses, to drive our locomotives and serve base culinary ends. And in that digging and extracting some lives are lost. The fewer lost the better, but the coal must be won. And so we think that the more tons we can win for each poor unfortunate killed or maimed, the more happy we should be. It would, therefore, seem that we should look with disfavor on the making of comparisons by percentages of men employed. If tomorrow a sufficient amount of coal could be mined by half the usual number of men, though the maimings and killings per employed man were raised a few per cent. by the exchange, we would have cause to rejoice, because the army of slain would be all but divided in two. We could not reasonably repine because by an erratic method of reasoning the percentage of slain had risen a few tenths.

Discussion by Readers

Comment, Criticism and Debate upon Previous Articles, and Letters from Practical Men

Three Mining Questions

In reading COAL AGE, each week, I have been much impressed with the way it brings us in touch with practical mining men—I think, more so than any mining paper or book I have ever read. It is interesting and what we want. There are three questions or matters to which I would like to refer; they are as follows:

CONTROLLING OR PREVENTING A MINE SQUEEZE

A mine adjoining ours had, at one time, a squeeze. We knew nothing of this till some of our rooms drove up and broke through into their old works. Now, our rooms are falling in on an entry close by; these rooms are "on ribs" (drawing pillars).

I should say our mine is worked in coke-region style, leaving 10 in. of roof coal up to support the drawslate, which overlies the coal and is soft and brittle.

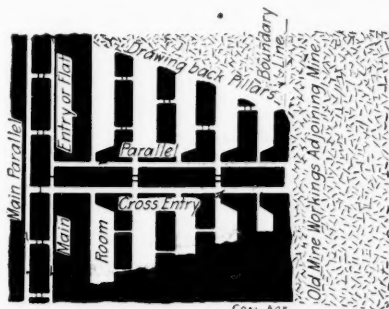


FIG. 1. PILLAR WORKINGS AFFECTED BY SQUEEZE. ROOMS IN SOLID COAL.

The coal is underlaid with 3 in. of slate, beneath which is 6 in. of fireclay. In the rooms "on ribs," the posts were set on the slate floor; but after starting the ribs (drawing pillars), the posts sunk through the slate and clay to solid bottom. The bottom, in the roadways, heaved; the caps above the posts were broken and the rooms squeezed. Cross-bars that were set to hold the roof were quickly broken.

A section of our mine is shown in Fig. 1, and the old workings of the adjoining mine on the right. Where the squeeze was first heavily felt was in the rib workings of the rooms driven off the parallel. As shown in Fig. 1, there were rooms, at that time, being driven off the cross-entry; and I thought to stop these rooms on the entry until the ribs of the rooms on the parallel were all out. Would this be wise, or is there any way by which I

can save this coal? I did not like to stop the rooms unless it was absolutely necessary, as I am short of places.

I would appreciate any suggestions that would show a way to get out this coal without a large expense. Should the line of fracture (line of pillar workings) be, as shown in Fig. 1, against the heading, or should it lead away from it? I have my own idea in regard to preventing or stopping a squeeze, but would be glad to hear how others would do the same.

ELECTRIC PUMP IN MINE

I have a pump run by electricity. The pump is located in the mine 1200 ft. from the water, and discharged through a pipe line 2000 ft. to the surface; 2-in. pipe being used for both suction and discharge. It is necessary to run this pump night and day to handle the water. Would it be wise, as I could easily make the change, to use a 3-in. pipe line and set the pump nearer the water? Let someone answer.

THE FIREBOSS QUESTION

The new bituminous-mine law (Art. 5, Sec. 1) seems to indicate that the firebosses at any mine or in any portion of a mine may be taken off and not employed, provided there has no gas been found in such mine or portion thereof for one year previous to the law being passed, or a year after.

I wonder if those who made this law thought that gas was the only danger that had to be provided for. I consider a nongaseous mine, having a shallow cover or depth below the surface, which has allowed the gas to escape as fast as generated, is often a dangerous mine and liable to dust explosion or heavy roof-falls. Such mines, though containing little or no gas, should be as carefully examined by a fireboss as the mine where gas has been found "in sufficient quantities to be detected by an approved safety lamp"; and it is important to do this before men are allowed to enter the mine, each shift.

T. E. RICHARDS.

Pittsburg Coal Co., Brownsville, Penn.

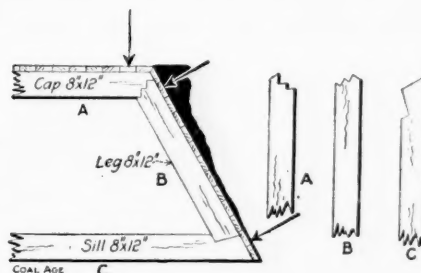
[Art. 5, Sec. 1, of the bituminous mine law, requires the mine foreman to employ a fireboss, in any mine or portion of a mine in which explosive gas has been generated within one year previous or shall be generated after the passage of the act, in quantities, etc. The requirement applies to all mines or parts of mines that have generated gas, at any

time, from a year previous to the passage of the act and is unlimited in its continuance.—EDITOR.]

Timbering for Side Pressures

Referring to the recent letters on timbering for side pressures, I wish to state that I have given mine timbering my careful attention for over 30 years, and that this problem is a hard one to solve. The accompanying sketch shows a method I have found to give excellent results and good service when properly set.

The sill, cap and legs should be cut so that all parts will have an equal bearing, and the timber can be cut for any degree of inclination of the posts desired. The arrows indicate the points at which the timbers should be blocked for the purpose of taking the first weight; timbers should not be blocked in the center, since that is the weakest point.



The improper setting of timbers is the most expensive piece of work in the mine; it not only endangers the lives of the men and shortens the life of the timbers set, but also makes the cost double, since it usually has to be immediately replaced. After the timber is in place it should be given some attention, especially up to the time it has taken the full weight expected for it. Some slight weakness often develops at this time, which can be easily and cheaply remedied by giving it prompt attention.

Derwent, Ohio. J. W. Q. MILLER.

The Mine Foreman's Trouble

I believe "The Foreman's Trouble," as given in COAL AGE, Dec. 23, 1911, p. 354, is hardly fair to the manager or operator of mines. The statement is made that the operator reminds the superintendent at every opportunity that he must keep down expenses. This is the most natural thing for an operator or manager to do.

Imagine for a moment the manager

sitting in his office twenty or a hundred miles from the works for the earnings of which he is held accountable, and the bills for supplies piling up before him and more requisitions coming in daily for more material, some of which he cannot imagine why or where it is needed; and here comes a rush order for some special high-priced oil to be rushed to the mines at once, while his records show that enough oil has been purchased to last a month longer. He wonders how they find room to set the posts that last month's records show were used; and why enough lumber or material is charged for stoppings to build four times the number the last survey showed would be necessary; and how enough iron rails were purchased to lay more tracks than they have in use.

He figures a little and finds that the pit-car oil used the last month amounts to one quart for each car dumped, and here is a letter saying that they are out and inclosing a requisition for more oil.

Reports show more troubles: Machinery broken down, boilers blistered or bulged, pumps out of order, etc. In the mine, several places are reported drowned out; the daily output or production of coal decreases, the cost of labor goes up. The drivers average 30 cars a day, while the length of their haul shows they should easily handle 50 cars. Twenty-five per cent. of the stock is reported disabled and not working; and a requisition asks for two more mules to take the place of those disabled. The bills for supplies are for iron, lumber, machinery, pipes, pumps, buckles, nails, fuse, rubber and duplicate parts of engines; yet with all these supplied the output is 200 tons a day less than should be expected; and it appears to this manager that the trouble lies with the mine superintendent or foreman.

The review of the last month's accounts decides the manager that he must take up the matter vigorously with the superintendent. A few cold facts are dictated and that official is informed briefly that "expenses are too high, and that he must get busy and either reduce his expenses or put out more coal."

The superintendent orders the mine foreman, master mechanic and other bosses, depending on the size of the plant, to lay off any spare men and economize in every way as much as possible. The men in charge may be competent men; the mine foreman and superintendent may have each established a record and proved their ability with other companies, and the manager, being a shrewd business man, is confident they can make good. Still, with all this, the results obtained do not show adequate efficiency in the management of the mine.

The foregoing is not an unusual case, and the blame may rest equally on all concerned in the management, yet each one generally thinks he is doing his duty,

and the blame is on the other fellow. I would suggest, first of all, that much good may be accomplished by starting at the lower end and striving to increase the efficiency of each man; having a direct talk with each one and with each and all of the bosses and assistant foremen, separately; and urging the boss driver to enlist his men in an effort to increase the output of coal.

Mr. Mining Engineer, consult with the inside foreman, and mix his practical ideas with your theory; they will generally mix to some extent, and a sensible, broad-minded foreman may help you to secure better results where local conditions necessitate a change, and the cost of haulage, pumping and ventilation in the mine will be reduced. Helped by your suggestions, he will have more confidence in himself, take more interest in his work, and be more loyal to you than if you ignore him, and give him to understand that he plays about fourth fiddle, and that he is only employed to fulfill the law's requirements and that you may be able to lay the blame on someone else if the inspector should complain about the condition of the mine. Remember, *it is easy to establish confidence, and likewise easy to destroy the confidence of the men in your charge.*

Harmony and coöperation on the part of all, in a mine, will do more good than a sackful of orders and complaints from the head office, when that office does not know why the results are poor, except as calculated from a mass of figures and reports often changed so as to convey an idea different from what really exists.

Better all get together and consult as to where the real trouble lies, and be ready, each one, to see some fault of his own that was laid to another. How often have we all passed by work that, while it belonged to another to perform, we could have done it ourselves and by so doing have helped to improve conditions and reduce expense and waste. For instance, a laborer may be sent to level off a pile of dirt, and in doing this he covers up some good material, possibly a good carwheel, or pipe, or piece of iron, because he was not told to move them. If you see it, have him move them, or do it for him, yourself. The carpenter or blacksmith, or any better-paid man may see it, but never lift a hand or offer to prevent it. Consider a tippie boss or shopman working beside a car of cement loaded to go to the mine, and making no attempt to cover or move it in case of an unexpected rain. One pumper tramps all day over a coil of packing, because the other man left it there. A few shovelfuls of dirt, moved in two minutes, may save thousands of gallons of water running into a mine, only to be pumped out again.

A workman can and often does lose a half-hour's time looking for the boss, to tell him a drain is overflowing, when he could have prevented it in 10 min. But,

of course, there are things that belong to the other man, and it is not our business to interfere all we are told. Such is usually the case where the system of *kicking the next man* is in use; but coöperation on the part of bosses and men will tend to prevent it. We are each a part of the system that transforms coal into the money of which we all have our share; just as truly as the cogs of a wheel each help to transmit the power from the engine to the load. Remember that the cogs must work together to move the load, and not pound on the ends. So do not pound at either end, in the office or in the mine; but all push together and coöperate to prevent loss and waste. Teach the man next to you, and pass it on to the man with the pick. It will promote loyalty and give better results.

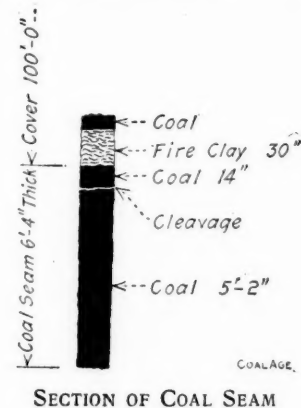
Some well-educated mining men lack ability to organize and coöperate with the men they depend on for their own success. We are glad to see some of our superiors come, because we feel they have helped us and they inspire us. We feel more confident, and our troubles are not as large as they looked before when they come. But the other kind of mine official leaves us with a discouraged and depressed mind; our duty seems harder and the load heavier. We wonder why our high-salaried friend does not approve of our work, or show us a better way, and as he disappears we feel the break in the intellectual machinery that is depended upon to get results. We are reminded to "cut costs and put out more coal," and this reminder comes by letter.

MINE FOREMAN.

Uniontown, Penn.

Method of Working a Coal Seam

I would be glad to see in COAL AGE the expression of the opinions of readers as to the best method of working a mine under the following conditions:



SECTION OF COAL SEAM

The coal is bituminous. As shown in Fig. 1, the thickness of the seam is 6 ft. 4 in.; and there is a distinct cleavage in the coal, 14 in. below the roof line. Above the coal is 30 in. of fireclay, and a thin stratum of coal overlies the clay.

The general custom has been to drive the entries 9 ft. wide. The fireclay above the coal weathers and falls when exposed to the air; and the 14 in. of coal next to the roof does not stay up very well. Assuming that the clay cannot be used for making clay products, what is the best way to support the entries and how should this coal be mined? The coal is strong enough so that steel I-beams could be used without legs, if desired, to support the roof.

CHARTER SUBSCRIBER.
Lexington, Ky.

Another Cost Sheet

I note in your issue of Jan. 13, an article by John A. Garcia, on cost sheets and daily reports.

There is one important omission in these forms, and I desire to bring it to your attention. I attach the blank, used by the Consolidated Indiana Coal Co. Items (B) and (C) in the third column of that blank originated in our office. To the information regarding the total cost at the end of each day is added a statement regarding the expenses incurred on previous days of the same month.

The form published by Mr. Garcia is incomplete, because it shows only the expenses on the date which it bears. On idle days and Sundays, more or less expense is incurred, and on our blank this is carried forward, so that the foreman can ascertain not merely the ratio of cost to tonnage on a single day, but the true ratio which he is obtaining over the larger period of time. Under the item which I

have marked (A), we show the expenses on the date under consideration; under (B) the expenses incurred during the portion of the month previous to the date of the sheet, and under (C) the expenses on all coal to date, omitting coal used under the boilers.

By requiring each foreman to study these sheets every day, we give him the advantage of immediate touch with his work. This constant reminder has considerable advantage over the delayed report, which Mr. Garcia exhibits in Fig. 2. You will note that earnings and profits are treated on a like basis in the lower right-hand corner.

CARL SCHOLZ,
General Manager,
Consolidated Indiana Coal Co.
Chicago, Ill.

CONSOLIDATED INDIANA COAL COMPANY

Daily Estimate of Expenses and Local Earnings of Mine No. Date..... 191..

					No.	Hrs.	Rate	Amt.	Per Ton						
					No.	Wkd.									
										Summary	Amt.	Per Ton			
Superintendence.					Hoisting and loading					Outside Material					
Hymera office											Rents—Material				
Asst. superintendent											Lubrication				
Local office					Engineers day						Feed used				
Top boss					Engineers night						Repairs				
Pit boss					Firemen day						Supplies used				
Night boss					Firemen night						Explosives used				
TOTAL					Engineers' helpers						Lubrication				
					Trimmers						Props and timber used				
					Weighmen						Rails used				
Engineering Corps					Cagers top					Mine cars					
TOTAL					Cagers bottom					Repairs					
					Dumpers					Supplies used					
					Slate pickers					Superintendence					
					Car-droppers					Engineering corps					
					Unloading rock					Mining					
					Screen cleaners					Haulage					
					Track weighmen					Inside labor					
					Car sealer					Hoisting and loading					
					Dockers					Ventilation and drainage					
					Check pullers					Outside labor					
					Box-car men					Loss and damage					
					Car pinchers					General expenses					
TOTAL										Rolls and deficient work					
										Yardage and room turning					
										Total operating expenses (A)					
										Brought forward this month (B)					
										Total operating expenses to date (C)					
										Production today					
										Less boiler coal					
										Net production today					
										Total output to date					
										Hours worked today					
										Days worked this month					
										Days idle this month					
										Additions and Backments	Labor				
											Material				
											TOTAL				
										Local earnings			Ex-penses	Reve-nue	Net Earn-ings
										Retail coal					
										Rents					
										Material					
										Explosives					
										Fuse					
										Blasting paper					
										Insurance					
										Smithing					
										Store commissions					
										Other commissions					
										Miscellaneous (itemize)					
										Total local earnings					
										Brought forward this month					
										TOTAL TO DATE					

In computing "costs per ton" boiler coal tonnage of each day must be subtracted from the daily output.

Correct:.....
Mine Clerk

Inquiries of General Interest

All Questions Must be Accompanied by Name and Address—Not for Publication

To Prevent Accumulation of Ice in Shaft

What is the surest and most practical means of keeping a very wet shaft clear of ice in winter? Is there any reasonable method of warming the air before it enters the shaft, or in any other way preventing the shaft from freezing in cold weather? Some have advised reversing the air current every 12 hr., but any one familiar with the conditions knows that it takes the return-air current a much longer time to thaw a body of ice than is required for that ice to form when the mercury is low; and, instead of keeping the downcast shaft clear, this method only tends to render both the downcast and upcast shafts dangerous from the accumulation of ice. Cannot some of the readers of COAL AGE suggest a plan that will be at once feasible and practicable; and that will rid the mines of this annoyance and danger.

THOMAS H. DEVLIN, SUPT.,
Assumption Coal and Mining Co.
Assumption, Ill.

No practical method has ever been devised, to our knowledge, of warming a cold air current before it enters the downcast shaft. To prevent the formation of ice in wet hoisting shafts, in winter, the best plan where this can be done with safety is to make the hoisting shaft the upcast. This plan, however, involves either making the main haulage roads the return airways for the mine, or the use of double doors on the main roads, at the shaft bottom. In a gassy mine, it will generally be unsafe to haul coal on the main-return airways; and it is never practicable to obstruct the main roads with doors.

Owing to these conditions it is generally impossible to prevent the formation of ice in a wet hoisting shaft, in winter, in a gassy mine where haulage is performed on the intake. As stated by correspondent, the alternate, daily, reversing of the air current is not practical, in most cases; and besides causes annoyance and is often impossible to arrange without making special provision for same at the shaft bottom.

The only seeming remedies, in a gassy mine, to avoid the danger of large accumulations of ice, in wet downcast shafts, in winter, is to install suitable water rings, at different levels in the shaft, which will collect the water and render the shaft much drier; or to install at certain levels a system of pipes to be heated

by exhaust or live steam, and which could be utilized as occasion would demand. The practise of exhausting steam into the shaft would hardly be applicable to a downcast hoisting shaft owing both to its annoyance and inefficiency. A wet shaft should always be made of ample dimensions to avoid serious troubles, later, in the operation of the mine.

Difference between Carbon Dioxide and Carbon Monoxide

Why is it that carbon dioxide (CO_2), which contains two atoms of oxygen, will not support combustion, but extinguishes the flame of a lamp; while carbon monoxide (CO), which contains only one atom of oxygen, not only permits lamps to burn, but is itself explosive, having the widest explosive range of any of the common mine gases?

Dayton, Tenn. TWO SUBSCRIBERS.

Carbon dioxide is the product of the complete combustion of carbon in oxygen (air), which means that the process of oxidation has reached the limit. The carbon, in other words, has taken up all the oxygen it is capable of absorbing; and the resulting product is fully satisfied or complete. The oxygen thus absorbed is not available for oxidizing any other substance; it is not free, but is tied up in a fully saturated compound (CO_2).

On the other hand, carbon monoxide (CO) is the product of the incomplete combustion of carbon in oxygen (air). In this case, the process of oxidation has not reached the limit; the carbon has a capacity to absorb more oxygen, and would have done so had the supply not been limited.

The difference between these two gases, in respect to their effect on the flame of a lamp, is not that one contains available oxygen that would support flame and the other does not. Neither of them contains any available oxygen. One of these gases, however (carbon monoxide, CO), is not a saturated compound, while the other (carbon dioxide, CO_2) is fully saturated. The former, therefore, is combustible and the latter incombustible.

When carbon monoxide is present in the atmosphere surrounding a lamp flame its combustion, in contact with the flame, adds to and assists the combustion of the flame. The flame burns more brightly than in pure air, owing to the heat developed by the combustion of the gas in the air that feeds the flame.

On the other hand, if the feed air is diluted with an incombustible gas, as carbon dioxide, the effect is to absorb the heat of combustion in the flame, and reduce the temperature and dim or extinguish the flame. Precisely the same effect, in less degree, would be produced if the feed air were to be diluted with nitrogen. The extinctive effect of carbon dioxide is much greater than that of nitrogen, however, because its power to absorb heat is 90 times the heat-absorbing power of nitrogen.

Weight Falling in Shaft

Would there be any difference in the velocity attained by two weights of 1 ton and 1 lb., respectively, falling down a shaft 200 ft. deep? Assuming each weight falls clear, which will strike the bottom first?

Dubois, Penn.

INQUIRER.

If it were possible for these two weights to fall in a perfect vacuum, their velocities would be equal, at any instant, throughout the fall; and they would strike the bottom at the same time. This is true, because there is no resistance to retard the falling bodies; and the force of gravity acts equally on each particle of their mass. In other words, under these conditions, there being no resistance, each particle is equally attracted and falls with equal velocity. In a vacuum, a feather falls with practically the same velocity as a lead ball.

Falling in a shaft, however, the resistance of the air, which is approximately in proportion to the surface of the falling body, increases less rapidly than the mass of the body or the attracting force that pulls it down. On this account, the greater weight meets with relatively less resistance in its fall in air, than the less weight. Its velocity, for the same instant, will be greater and it will reach the bottom of the shaft sooner than the lesser weight.

The question is often asked, "Does a man weigh any less when standing in a rapidly descending elevator or cage; or does he weigh any more when the cage in which he is standing is being hoisted rapidly, than when the same man is standing on the ground?" Since *weight* is the product of *mass* and *gravity*, and neither of them change, the man will weigh the same whether rising or falling; but when the velocity of the moving cage is being changed, increased or decreased, the pressure of the man on the floor is changed accordingly.

Examination Questions

Selected from State Examinations, or Suggested by Correspondents

Questions for Beginners

VENTILATING PRESSURE

Ques.—(a) What is meant by *ventilating pressure*, in mine ventilation? (b) What is the *unit of ventilating pressure*?

Ans.—(c) Ventilating pressure is the pressure producing the circulation, or the difference between the intake and return pressures in a mine, exerted over the entire sectional area of the airway. It is this total pressure in the airway (*pa*) that pushes or moves the air against the resistance of the mine.

(b) The unit of ventilating pressure or *unit pressure* is the pressure exerted on a single square foot of the sectional area of the airway. It is this unit pressure, or pressure per square foot, in a mine or airway, that is measured by the water gage. Each inch of water gage corresponds to a ventilating pressure of 5.2 lb. per sq.ft. in the airway, at the point where the reading is taken.

Ques.—Show how each inch of water gage corresponds to a pressure of 5.2 lb. per sq.ft.

Ans.—Weight always causes an equal pressure on the base of support. For example, the weight of 1 cu.ft. of pure water (Fig. 1) is practically 62.5 lb. and this causes a pressure of 62.5 lb. per sq.ft. for each 12 in. depth of water. If the water is only 1 in. deep, the weight is $\frac{62.5}{12} = 5.2$ lb., which causes, therefore, a pressure of 5.2 lb. per sq.ft.

An important principle to be remembered is that water always rises to its own level no matter what may be the shape or size of the containing vessel. If the water gage shown on the left of the box, in Fig. 1, were attached to the bottom of the box the inch of depth of water in the box would simply balance the 1 in. of water shown in the gage. This shows clearly that a pressure of 5.2 lb. per sq.ft. is required to balance or produce 1 in. of water gage. The depression of the water in the left arm of the gage represents this pressure.

Ques.—What is meant by the expressions *atmospheric pressure*, *barometric pressure*, *sea-level pressure*? Explain briefly the cause of each pressure and how it is different in different places and at different times. What is meant by normal pressure in speaking of the atmosphere?

Ans.—Atmospheric pressure is the pressure due to the weight of the atmosphere pressing on each square unit

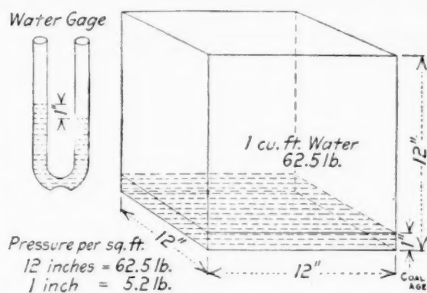


FIG. 1. SHOWING PRESSURE PER SQUARE FOOT DUE TO 1 INCH OF WATER GAGE

of the surface of the earth. This pressure is commonly given in *pounds per square inch* or *per square foot*.

Barometric pressure refers to the pressure of the atmosphere expressed in *inches of mercury*. The weight of a cubic inch of mercury (standard 32° F.) is a trifle less than $\frac{1}{2}$ lb. Roughly, 30 in. of mercury weigh 15 lb.

Elevation above Sea Level (Feet)	Mean Observed Temperature (Fahrenheit)	Weight of Air (lb. per cu. ft.)	Lb. per sq. ft.	Lb. per sq. in.	Water Column Maximum Density (Feet)	Mercury Column (Inches)
25,000	0°	0.0327	802.2	5.571	12.85	11.343
20,000	8°	0.0393	981.2	6.814	15.70	13.874
15,000	17°	0.0472	1198.5	8.323	19.17	16.948
10,000	27°	0.0561	1455.4	10.107	23.30	20.582
5,000	41°	0.0659	1760.3	12.224	28.20	24.890
1,000	55°	0.0744	2041.1	14.174	32.70	28.861
Sea Level	60°	0.0764	2116.2	14.696	33.90	29.925

FIG. 2. SHOWING EFFECT OF ELEVATION ON TEMPERATURE AND DENSITY OF AIR, ATMOSPHERIC PRESSURE AND HEIGHT OF WATER AND MERCURY COLUMNS SUPPORTED BY ATMOSPHERE

Sea-level pressure refers to the common or ordinary (normal) pressure of the atmosphere at sea level, which is roughly 15 lb. per sq.in., or 30 in. barometer.

All atmospheric pressure is due to the weight of the air column above the place where the pressure is measured. This pressure, therefore, decreases as we ascend above sea level, and increases as one descends below sea level, as is true in many deep mines.

Atmospheric pressure changes slightly during each day, being greatest about 10 a.m. and p.m. and least about 4 a.m. and p.m.; there is also a slight change according to the season of the year, being greater in winter and less in summer, in the northern hemisphere. The greatest fluctuation, however, is due to local storms, the storm center being an area of low barometric pressure.

The normal pressure is an average for any place, for the year. It is what the pressure should be under normal atmospheric conditions. Fig. 2 shows an imaginary air column one foot square in section. Starting from sea level, different elevations are marked on the left of the column; and, on the right, the corresponding mean observed temperatures, weight per cubic foot or density of air, the pressure per square foot and per square inch, and the water column and mercury column such pressure will support against a vacuum.

Ques.—What is meant by *absolute pressure*?

Ans.—Absolute pressure is the pressure above a vacuum.

Ques.—Explain the difference between ventilating pressure and absolute pressure.

Ans.—Ventilating pressure is the excess of the intake pressure over the return pressure, for the entire mine or any section of the mine. Absolute pressure is the total or actual pressure borne by the air or gas. When a mine is ventilated on the blowing system the absolute pressure on the air in the fan drift is equal to the atmospheric pressure *plus* the mine ventilating pressure. In case the fan is exhausting instead of blowing, the absolute pressure on the air in the fan drift is equal to the atmospheric pressure *minus* the mine ventilating pressure. In each case, it is necessary to reduce the mine pressure to lb. per sq.in., or else estimate the atmospheric pressure in lb. per sq.ft.

Coal and Coke News

From Our Own Representatives in Various Important Mining Centers

Washington, D. C.

The employers' liability and workmen's compensation commission has made public the text of a bill representing the results of its deliberations during the past year. The bill applies chiefly to railroads, but it is intended subsequently to extend the provisions further and to attempt to make them a basis for uniform state legislation; that is, if the measure is adopted, as it probably will be. The proposed bill is therefore of general industrial significance. As offered by the commission it provides that:

"Every carrier engaged in interstate or foreign commerce by railroad shall pay compensation in the amounts specified in the bill to any of its employees who, while employed by such employer in such commerce, sustains personal injury by accident arising out of and in the course of his employment and resulting in his disability, or to his dependents in case of death.

"That the remedy thus afforded shall be exclusive, and that all existing common-law and statutory remedies, so far as future cases are concerned, shall be abolished." And that:

"This compensation is to be paid in every case specified irrespective of negligence, except where the injury or death is occasioned by the willful intention of the employee to bring about the injury or death of himself or another or when the same resulted from his intoxication while on duty."

Fixed schedules of compensation for death and personal injury are submitted, together with numerous rules, conditions and provisions for various contingencies.

COST OF CARRYING COAL TO PANAMA

Extensive inquiries into the cost of carrying coal to the Panama Canal by government vessels have been undertaken by Secretary Meyer and the results thereof supplied to the House Committee on Interstate and Foreign Commerce, in order that members may be able to judge of the relative cost of supplying coal at the canal by government agency and by private enterprise. The statements which are now before the committee show that in the case of the "Cyclops," one of the newest and best of the government colliers, the combined cargo and bunker capacity is 12,500 tons, maximum speed 14 knots, economical speed about 10 knots and cost \$822,500.

Based on the cost of operating the "Cyclops," the annual operating expenses of the proposed canal colliers would be approximately \$196,000 and allowing 15 round trips annually, the delivery cost per ton of coal would be about \$1.14.

There is little doubt that these proposed colliers could deliver coal at Colon more cheaply than could private merchant ships. In comparison with the estimated cost of \$1.14 per ton, the following freight rates by steamer to points in the West Indies and Caribbean during 1911 are compiled from the W. W. Beattie & Co.'s Coal Trade Freight Reports:

From Norfolk to	Low	High	Average
Havana, Cuba	\$1.30	\$1.85	\$1.57
Matanzas, Cuba	1.30	1.85	1.57
Cardenas, Cuba	1.50	2.25	1.87
Cienfuegos, Cuba ..	1.50	2.25	1.87
Port of Spain, Trinidad	1.75	2.50	2.10
St. Lucia	1.65	2.30	1.97
St. Thomas	1.40	1.90	1.65
Barbados	1.75	2.50	2.12
Kingston	1.40	1.90	1.65
Curacao	1.15	1.70	1.42
Vera Cruz	1.60	2.25	1.92
Guantanamo	1.50	2.20	1.85

Assuming that the canal will require 3000 tons of coal per day at first, the gain from employing government colliers would be \$788,400 annually, and when the business of the canal shall have increased to equal that of the Suez Canal the annual gain would amount to about \$2,102,400. This estimate is based on an initial canal traffic of five ships per day, each ship taking 500 tons of coal, and ultimately a traffic of 15 ships per day. It is assumed also that the canal power and lighting plants, the Panama R.R., etc., will use at least 500 tons per day.

CHARGES FOR DUMPING AND TRIMMING

The Interstate Commerce Commission has rendered an important decision in the case of the New England Coal & Coke Co. vs. the Norfolk & Western Ry. Co. *et al*, in which it holds that:

1. Trimming, or leveling coal in the holds of ships, is a necessary service in connection with the transportation of coal by water, and, where performed by the rail carriers, it must be regarded as a part of the delivery. Whether or not defendants legally might be compelled to render such service, when they undertake so to do any charge therefor is subject to regulation by this Commission.

2. The charges of 3c. per ton for trimming and 4.5c. per ton for dumping

and trimming are not found to have been unreasonable. The charge of the Virginian Ry. of 4.5c. per ton for trimming alone is found to have been unreasonable to the extent it exceeded 3c. per ton. Reparation is awarded.

Alabama

Birmingham—It is understood that the differences between the state and the Sloss-Sheffield Steel & Iron Co., regarding the agreement for mining coal with state convicts, have been satisfactorily adjusted by a few slight amendments to the contract. One of the provisions of the contract was the expenditure of about \$10,000 in improvements of various kinds at the mines. These improvements are well under way. They have to do with enlargements of barracks and the installation of a more extensive sanitary system.

Colorado

Denver—The government has brought suit to recover the patent to 160 acres of coal land in Huerfano County and \$100,000, said to be the product of the land. The Beacon coal mine is located on this property, which has passed through the hands of a half dozen owners since original entry was made six years ago. The government maintains that the land was obtained by fraudulent entry.

Representatives of the Denver Trades and Labor Assembly, the Direct Legislation League and other bodies interested in having the state operate and control coal mines, have agreed upon the form of the bill to be presented to the people for their approval at the next election for members of the general assembly. It provides that all land, bearing coal which is now owned by the state or may later be acquired, shall never be sold. An administrative board is provided for and is empowered to engage in the business of mining coal and selling it to the consumer.

Illinois

Chicago—A sweeping investigation of conditions governing the distribution of coal cars at mines in Illinois, Indiana, Kentucky, and Ohio will be made by the Illinois State Railroad and Warehouse Commission during the next few weeks with a view to establishing some uniform rule covering such distribution in this section of the United States. The Inter-

state Commerce Commission and the different railroad commissions of the states mentioned will be invited to participate in the investigation and subsequent hearing, at which it is proposed to establish a uniform rule.

The Illinois Central R.R. Co. has apparently overcome the dissatisfaction in several of the mining towns on its line that was caused by the failure of the railroad to furnish cars enough to enable the mines to work more than one day per week. Every coal-mining town on the road has now received orders for company coal, which is being stored in the open fields around the mine tipples.

Litchfield—A deal was consummated recently by Chicago and New York capitalists that consolidates four of the leading coal mines in Montgomery County and places them under the control of one company. The four mines involved are: Taylor Springs, Kortkamp and the two Witt mines. It is probable that the new company will take over the mines at Nokomis, also in this county.

Murphysboro—Fire, Feb. 18, destroyed the plant of the Knickerbocker Briquet Co., one mile from Murphysboro, and adjacent to the Harrison mine, of the Big Muddy Coal & Iron Co. The loss was \$100,000. The plant was erected three years ago, being the only one of its kind in the high-grade coal field of southern Illinois, and is owned by A. G. Kupfel, of New York.

Witt—Burnwell mine No. 2 was closed down for several days recently by an accident to a hoisting cage. The bridle chains broke and the cage fell from a point within 20 ft. of the top of the shaft to the bottom, a distance of about 500 ft. Coal was being hoisted at the time.

Indiana

Princeton—Drilling operations are being carried on in this vicinity by the Princeton Coal Co. to determine the value of the No. 4 seam, which lies 50 ft. below the surface. If the seam proves to be as expected a new mine is looked for in the near future.

Vincennes—It was announced recently that the Martin-Howe Coal & Mining Co., of Chicago, will enter the new coal field that is under development near Bruceville. The Martin-Howe company is interested in the Freeman and Tecumseh mines at Bicknell. The property this company intends to develop is two miles southeast of Bruceville.

Iowa

Des Moines—Union miners of Iowa will meet in annual convention here on Mar. 14. They will come prepared to demand a raise in wages of 10c. a ton and of 20 per cent. for day work. The operators will refuse to meet that demand, and

as a result it is predicted that the mines of Iowa will all shut down on Apr. 1 until a new wage scale is agreed upon. Railroads and other large consumers of coal in the state are already preparing for the shutdown by storing large quantities of coal as rapidly as possible. Representatives of the miners and operators will meet in wage-scale conference on Mar. 21, one week after the opening of the miners' convention.

Kansas

Columbus—Owners of business buildings in Weir City have applied to the district court for an order to restrain R. L. Thorp from mining coal under the streets and certain lots of the city. The applicants allege that if the mining operations are continued there is reason to fear that buildings will be jeopardized. While extensive mining operations have been carried on within the municipal limits since the field was developed, this is the first time the city has attempted to stop them or to collect the value of coal removed.

Pittsburg—The coal fields in Kansas, Missouri, Oklahoma and Arkansas are operated by firms belonging to the Southwestern Coal Operators' Association. The operators and the miners in this field signed a two-year contract, which will expire Mar. 31, but the contract contains a provision that the mines must continue in operation for the period from the expiration of the contract to Apr. 30, while the miners and operators are negotiating a new contract.

Kentucky

Louisville—Local coal operators are interested in the organization of a new coal company which will have a capital stock of \$2,000,000, and which will carry on operations on a large scale in the newly opened Harlan County fields. The Kentucky Mutual Coal Corporation will be the title of the new organization, and will be composed of New York and Kentucky capitalists. The proposed company will take over the holdings of a number of smaller concerns in southeastern Kentucky and will conduct coal operations on a large scale. The full details have not been perfected, but it is expected that all plans will materialize within the next few weeks.

Greenville—Coal operators in western Kentucky are complaining of the rating placed on their output by the Illinois Central R.R. Co. This assumed output forms the basis for car distribution by the railroad and greatly reduces the number of cars that are to be furnished the mines in western Kentucky, the number to all mines on this division, with possibly two exceptions, being reduced. The matter of the right of the railroad thus to fix the output of the mines by limiting the supply of cars furnished will be called to the at-

tention of the Kentucky railroad commission, and also to the interstate commerce commission.

Missouri

Huntsville—The coal washer that has been under construction for a number of months at the old No. 10 plant of the Northern Central Coal Co. has recently been completed and tried out with satisfactory results. The washer was built at considerable expense and embodies up-to-date methods and modern machinery.

Ohio

Toledo—Over 12,000 cars of coal were found Feb. 18, to be tied up in the blockade at Toledo, owing to the inability of the Michigan lines to handle the cars. The Pere Marquette declared an embargo on coal. The value of the hard and soft coal tied up at Toledo was estimated at about \$3,000,000. Every available storage switch and sidetrack between Columbus and Toledo is filled with loaded cars of coal, and it is said that thousands of tons of coal are northward bound from the southern Ohio and West Virginia fields.

Cleveland—Arrangements have been made by a Cleveland coal shipper with a firm which owns a large fleet of boats, to float in the neighborhood of 400,000 tons of coal. The contract does not call for any specific rate, but the freight will be charged at the going rate. This makes more than 650,000 tons of soft coal that have been contracted for recently.

Columbus—Considerable interesting evidence was adduced at the hearing of the interstate commerce commission in Columbus recently in the case of the New Pittsburg Coal Co. which challenged the lake rates from the Hocking Valley. The present rate is 90c. and an effort is being made to have it reduced to 75c. or less.

There is a division of sentiment on the probability of a suspension at the expiration of the present wage scale. Some of the operators and jobbers profess to feel that the miners will agree to work pending a settlement of the scale but others are inclined to believe that such a course is improbable. The miners usually have gone out pending a settlement of the scale and there is nothing at this time to indicate a change in that custom.

Oklahoma

Lehigh—A serious fire started in the No. 5 mine of the Western Coal & Mining Co., near here in the morning of Feb. 22. The workings lie about 300 ft. below the surface and the number of men at work at the time is variously estimated at between one and two hundred. Most of the men escaped through an abandoned shaft about two miles from the main entrance to the mine. Thirty cars of coal

that were standing in the workings are reported to have added materially to the flames. Last advices state that 8 bodies have been removed and one man is still unaccounted for. It is believed that these comprise all the casualties. A score or men were entombed, and later rescued. Rescue parties from the government station at McAlester were rushed to the scene and immediately began exploration of the workings near the mouth of the pit.

Pennsylvania

BITUMINOUS

Butler—The Sharon Coal & Limestone Co. which has been operating in this section for some time, recently secured leases on a number of acres of coal land in Mercer and Slippery Rock townships. The company has expended considerable money testing for coal on these properties. The total amount of land leased so far is 671 acres but it is expected that additional leases will be made in the same neighborhood.

E. W. Eisler, of Butler, who has taken up a number of options on coal land in Middlesex township, recently purchased the H. W. Flick farm in that township, paying \$12,000 for its 99 acres. This farm is centrally located in the property held by Mr. Eisler and it is expected that active development of his holdings will commence during the present year.

Somerset—Interests affiliated with the Western Maryland R.R. Co. are understood to be negotiating for the Brothers-Valley Coal Mining Co.'s plant near Berlin. The plant is one of the largest in this section and would give the Western Maryland a big tonnage. Now that the Western Maryland's tracks are going down rapidly, agents are in the field trying to option coal lands, and everybody is waiting for spring to give the signal for considerable activity.

Connellsville—The number of active ovens in this region has been increased by the firing of 50 at Mt. Braddock, 40 at Dexter, 80 at Elizabeth, 25 at Griffin and 10 at La Belle; total, 205; and decreased by the blowing out of 25 at Grace, 10 at Cyrilla, and 12 at Eleanor, total, 47, making a net increase of 158 ovens.

Pittsburg—A large delegation appeared before the rivers and harbors committee of Congress, in Washington, Feb. 19 and advocated the extensive improvement of the Allegheny River in order to facilitate shipping.

A party of more than 40 officials, employees and guests of the Pittsburg branch of the U. S. Bureau of Mines, went to Bruceeton, Feb. 24, for the second of a series of explosions at the government's experimental coal mine there, to

determine the best means of preventing mine disasters. The tests were in charge of Chief Mining Engineer G. S. Rice.

ANTHRACITE

Scranton—A federal grand jury, at Albany, N. Y., Feb. 21, returned indictments against the Delaware & Hudson Co., charging violation of the commodities clause of the interstate commerce law. There are 30 counts in the indictment, which is the beginning of a campaign by the government to force the railroad to give up the ownership of its coal mines.

The conference between representatives of the anthracite operators and miners, held in New York, Feb. 27, lasted about 15 minutes. The miners' demands were presented and taken under consideration by the operators. A meeting of representatives of the operators will be held, Mar. 5, and a committee appointed to confer with the miners. A joint conference will be held, probably Mar. 13.

The Delaware & Hudson company is building a new breaker at its "Gravity Slope" mine, near Winton, Lackawanna County.

Wilkes-Barre—Coal companies in this section expect, during March, to store at their various collieries a large quantity of steam coal for their own use. They anticipate, if there is no strike following the expiration of the existing agreement, that there will at least be a suspension of work for some weeks, during which time the miners' leaders will conduct negotiations with the operators before finally reporting to the men their decision regarding the situation.

Virginia

Bristol—It is reported that H. K. McHarg, Jr., a wealthy capitalist of Radford, Va., has bought a controlling interest in the Empire Coal Land Corporation, a concern which owns several thousand acres of Wise County, Va., coal lands, a large part of the properties lying along the Kentucky border.

West Virginia

Wheeling—The Herbert Collieries Corporation, which has its principal offices, in New York, and is engaged in mining coal on leased lands in Fayette and Raleigh Counties, West Virginia, filed a voluntary petition in bankruptcy, Feb. 24, giving liabilities of \$244,083 and assets of \$168,898. The assets, the petition states, include leases of mines in West Virginia valued at \$150,000, stock in a mine store at Herberton, W. Va., worth \$10,000, and debts due aggregating \$6398. The mines operated by the corporation were leased from the McKinley Fuel Co. by Preston B. McClarahan, who assigned his interest in the properties to the Herbert Collieries.

The Western Maryland R.R. is hauling large quantities of coal from West Virginia mines to Baltimore, and Hagerstown, Md. The increase has been so great within the past few weeks that there is great difficulty in getting sufficient engines to move the trains, causing congestion in the various yards of the railroad. It is said, there are 15,000 carloads of coal stored on these lines awaiting transportation.

Wyoming

Sheridan—Increased freight rates proposed by the Chicago, Burlington & Quincy R.R. on coal from mines in Wyoming to junction points in Montana and beyond were suspended, Feb. 17, by the Interstate Commerce Commission, pending an investigation.

It is stated that mines in the southern part of the state are operating more steadily than those in the local field. This fact is accounted for on the grounds that the southern mines are largely owned by the railroad and smelting interests and their entire production is used by these interests, while the northern mines are commercial mines and depend upon the market to handle their product.

Canada

Victoria, B. C.—The British Columbia government proposes to send engineers to the country between Stewart and Ground Hog Mountain to obtain data for the proposed construction of a railroad from Stewart to tap the Ground Hog Mountain coal fields, this line eventually to form a link in another trans-continental system.

The next examination for mine managers, overmen, fire bosses and shot lighters will be held the latter part of April or early in May.

Calgary, B. C.—The city council has placed itself on record as in favor of having the municipality own and operate a coal mine, and has authorized placing \$2500 in the estimates to cover the cost of investigating the different propositions offered to the city.

Great Britain

London—A national coal strike was virtually inaugurated, Feb. 27, when between 30,000 and 40,000 miners in Derbyshire and Nottinghamshire ceased work. This number was increased to 100,000 Feb. 28. No settlement was reached at the various conferences, Feb. 27, between the government and representatives of the miners and operators, although it was reported that the outlook had become more hopeful. Large purchases of Pocahontas coal for the British navy are announced. This will be shipped from Norfolk within 60 days. The first shipment of 25,000 tons will go forward as soon as the chartered steamers arrive.

Personals

John W. Braham has resigned his position with the West Virginia Colliery Co., at Wevaco, to become superintendent for the Clear Fork Coal Co., at Jarrolds Valley, W. Va.

J. E. Pettit, Utah state coal mine inspector, has returned to Salt Lake from a trip through Emery County, where he visited the mines at Castle Gate, Mohrland and Price.

E. J. Wallace has severed his connection with the Mississippi Valley Fuel Co., St. Louis, Mo., effective Feb. 19, and is now handling his trade from an office in the Victoria Building.

James Needham, president of the St. Paul Coal Co., is making an extended visit to the mining properties of the company in the West and expects to return to Ottawa, Ill., early in March.

T. K. Adams and Enoch W. Filer, of Mercer, Penn., and George Young, of Stoneboro, have been appointed members of the examining board for the third bituminous district of Pennsylvania.

B. B. Thayer, president of the Anacosta Copper Mining Co., in company with F. W. C. Whyte, general manager of coal properties, recently made an inspection of the company's coal mines at Diamondville, Wyoming.

R. A. Gray, general manager of the J. R. Crowe Coal Co., of Pittsburg, Kan., is taking full charge of the company's business in the absence of Mr. Crowe, who is making an extended trip to Panama and South America.

E. E. Bach has been appointed sociological superintendent, in charge of improvement work at the Ellsworth and Cokeburg plants of the Ellsworth Collieries Co. In creating this office the Ellsworth company has taken a pioneer step, so far as the coal industry is concerned.

Elmer E. Thomas, of Omaha, a representative of the United States Coal Co., together with C. V. Gould, of Chicago, a civil engineer for this company, have been in the vicinity of Kemmerer, Wyo., for some time, arranging for the opening of a new coal mine in this district to be located on the old Adaville property.

George O. Thomas, of Wilkes-Barre, Penn., for 20 years superintendent of the Clear Spring colliery, West Pittston, until its abandonment recently, has been appointed general inside superintendent of the Harleigh and Pond Creek collieries near Hazleton. Mr. Thomas has lately filled the position of inside superintendent of the Parrish and Buttonwood mines of the Parrish Coal Co. at Plymouth. The collieries named, both at Hazleton and Plymouth, are controlled by Madeira, Hill & Co., of Philadelphia.

Obituary

T. Guilford Smith, a member of the firm of Albright & Smith, agents at Buffalo for the Philadelphia & Reading Coal & Iron Co., died at his home on Feb. 21, aged 72 years. He was well known in the coal and iron trades and actively identified with educational work in New York state. Mr. Smith was a member of several American and international scientific organizations.

Construction News

Birmingham, Ala.—The Bryan Coal Corporation, of Birmingham, will make extensive improvements on its property, at Red Star, including the erection of a coal washer. It is estimated that about \$225,000, in all, will be expended. Frank Nelson, Jr., is president.

The Cullman Coal & Coke Co. is reported to intend completing the railroad from Cullman to the Bremen coal fields.

Calvert, Tex.—The Central Texas Fuel Co. is preparing to develop about 250 acres of land for an output of 500 tons of coal per day. Machinery will be required at an early date, and an aerial tramway, about ½ mile long, will be constructed. Robert Magee is constructing engineer.

Barbourville, Ky.—The Clover Fork Coal Co., of Harlan, Ky., capitalized at \$50,000, will develop 800 acres of coal land for an output of 500 to 1000 tons per day. Machinery and other equipment will be installed. B. W. Whitfield is the engineer in charge.

Scranton, Penn.—Kingsley and Wescott, of this city, have secured the contract for rebuilding the Bernice breaker of the Connell Anthracite Coal Co., which was recently destroyed by fire. Cost to be about \$125,000.

Duluth, Minn.—The contract for the machinery equipment of the new Island Creek Coal Co.'s dock has been awarded to Heyl & Patterson, Pittsburg, Penn., at about \$300,000. The Zenith Dredge Co. has secured the dredging contract in connection with this work at \$100,000.

Bay City, Mich.—The Robert Gage Coal Co. will sink a new shaft near St. Charles this spring. Charles Coryell is manager.

Pittsburg, Penn.—The U. S. Bureau of Mines is planning to enlarge the testing station at Fortieth and Butler Sts. The new buildings will cost in the neighborhood of \$200,000. H. W. Wilson is engineer in charge.

Indianapolis—The Rowland Block Coal Co., recently incorporated with a capital of \$100,000, will sink shafts, build tipples and install machinery to do a coal and clay-mining business at their property near Parkersburg, Owen County. George Rowland is a director.

Publications Received

ANNUAL REPORT OF STATE MINE INSPECTOR, SOUTH DAKOTA, FOR 1911. By Robert L. Daugherty. 16 pp., 6x9 in.; pamphlet.

BRITISH COLUMBIA COAL AND COKE. Pamphlet. 14 pp., 4½x7½ in.; illustrated.

This little book is issued for private circulation by W. E. Duncan, M. E., a consulting engineer of Merritt, B. C. It presents interesting news and facts concerning the British Columbia field and includes a directory of the companies operating in this region.

EXPLOSIVE MINE GASES AND DUSTS. By Rollin T. Chamberlain. Bulletin No. 26, U. S. Bureau of Mines. 67 pp., 6x9 in.

This report is a reprint of U. S. Geological Survey Bulletin No. 383, and has special reference to the explosions in the Monogah, Darr and Naomi coal mines in December, 1907. The results of the experiments set forth in this bulletin and the conclusions drawn have become generally familiar to the mining industry since their first publication in 1909.

Industrial Notes

The J. A. Brennan Drilling Co., of Scranton and Pittsburg, Penn., announce that during the year 1911 they took out over 30,000 ft. of cores in connection with diamond-drill operations on prospecting work. This company is fully equipped to undertake drilling work in any part of the United States, Canada, Mexico, or South America and contracts to produce a continuous core showing the strata beneath the land under examination.

The Best Manufacturing Co., Pittsburg, Penn., announces that it has engaged the services of Howard W. Evans as general manager of sales, who will hereafter supervise the sales, order and engineering departments. Mr. Evans is a specialist in this line of work and will be pleased to advise with prospective buyers of piping materials. With its new plant and complete engineering force, the Best company states that it is in a position to lay out entire piping systems, furnishing the material, cut and fitted ready for erection or to take contracts to furnish and install such systems complete and ready for operation.

E. B. Day, secretary and treasurer of the West Virginia Mining Institute, 108 Smithfield St., Pittsburg, Penn., is placing on the market a map-directory covering the State of West Virginia and two counties of Maryland. It is printed on linen, of a size suitable for hanging on the wall and gives among other matters, the location and authentic information concerning 500 mining companies and 815 mines in the territory covered. Each mine is numbered on the map and is thus referred to a chart directory giving the name of the operating company, the names of the various officials with the addresses of each, the name of the mine with its post office address, county, and railroad connections, the seam mined, thickness, kind of opening, kind of haulage, method of mining, number of men employed, number of coke ovens, capacity of mine, grades shipped, trade name and analysis of coal.

Coal Trade Reviews

Current Prices of Coal and Coke and Market Conditions in the Important Centers

General Review

With the prospective strike of the union miners now less than a month off, and only sufficient fuel in sight to meet current demands, the coal industry probably never faced a labor crisis under less favorable conditions. Strike possibilities in the past have invariably been anticipated by operators and consumers alike by the accumulation of large storage reserves, while in this instance supplies generally are reported low, and in many cases below all previous records. In view of the fact that for the first time both the anthracite and bituminous agreements expire simultaneously, this shortage in supplies is of particular significance.

The movement on railroads has improved materially during the past week, with the exception of some isolated districts, which are still feeling the effects of the congestion. Many large consumers will doubtless avail themselves of this opportunity to acquire what surplus stocks they can between now and Apr. 1. As is well known, the capacity of the mines—except in anthracite—far exceeds that of the normal consumption, and with favorable transportation conditions in effect, there is still an opportunity for the storage of heavy tonnages. That the operators of the Middle West are thoroughly alarmed over the outlook is evidenced by the fact that the entire output of some mines on the Illinois Central (on which the car service is particularly bad) is being stored on the ground.

On the other hand, many large steam users are not manifesting a very strong desire to stock because of the ruling high prices, due to the scarcity in all grades and sizes. They are withholding their requisitions pending a return to more normal conditions in the trade, and a consistent adherence to this policy will tend to make the situation still more acute, later. In any event, the trade will technically require a strike of short duration or suffer a severe depression during the period the surplus supplies, now being accumulated, are worked off.

Boston, Mass.

The expected has happened and prices are decidedly on the upward trend. At all points bituminous has jumped to high figures, and something of a scramble prevails at distributing centers. With contracts expiring Mar. 31, buyers are striv-

ing to cover supplies at least to May 1, and apparently figures will be reached that have not been quoted since 1903. Available coal is snapped up as soon as it is offered, and from a selling standpoint, each sale turns out to be a poor one. At the same time one large distributing company at Boston is naming \$3.80 on cars, Mystic Wharf, for yearly contract, as against \$3.30 for similar trade a year ago.

Pennsylvania bituminous has a ready call at tide, both at New York and Philadelphia, and at prices considerably advanced. The higher grades along with Georges Creek are out of the question for new purchases.

Marine freights are also firmer, \$1.25 having been paid Hampton Roads to Providence on a large tonnage, and \$1.35 to Boston. As high as \$1.25 is freely paid New York to Boston on anthracite, and \$1.15 to Providence for the same loading.

Anthracite is far behind on deliveries, and no hopes are held out; it has gone beyond a matter of sizes. From New York almost nothing is being received except individual coals in transportation engaged in the open market. What company barges arrive are loaded with screenings and stock egg. Broken and pea are not to be had. The situation is critical and there are interesting times ahead.

Prices range about as follows:

Clearfield ¹	\$1.55 @ 1.75
Somerset ¹	1.70 @ 1.85
Bituminous, en route to junction points ¹	1.90 @ 2.20
Pocahontas, New River ²	3.25 @ 3.35
No. 4 Pocahontas, Clinch Valley, etc. ²	2.75 @ 3.00
Pocahontas, New River, Boston or Portland, on cars	5.00 @ 5.25
Pocahontas, New River, Providence, on cars	4.75 @ 5.00
Anthracite, egg and stove ¹	4.25 @ 4.50
Anthracite, egg and stove, f.o.b. New York	5.25 @ 5.50
¹ For shipment f.o.b. mines.	
² F.o.b. Hampton Roads.	

New York

Strike talk, combined with the short supply of soft coal here, has greatly stimulated the New York market and prices have advanced rapidly until even the lowest grades of steam coals are being held at from \$2.90 to \$3, f.o.b., and only a very small tonnage can be bought at those prices. The supply at the piers is extremely limited and shippers are barely able to take care of contract requirements with the coal they have available. The market here has not been so short in a long time.

All-rail demand is strong and prices for line shipment have also advanced. About the only coals that can be obtained for prompt shipment are of very ordinary quality and these readily command from \$1.35 to \$1.50, f.o.b. mines.

From consumers located on shoal-water points, shippers are beginning to receive orders to commence deliveries as soon as navigation opens. This would indicate that the supplies, accumulated last year, to carry over the winter period, have been reduced excessively by the severe winter, as ordinarily their stocks carry them well into April.

Philadelphia, Penn.

There is practically no change in the retail trade in this locality. The dealers all continue busy—not with the feverish activity of some few weeks ago, but there is a good demand, which depletes their stocks as fast as they can be accumulated. Pea coal seems to be the most difficult to procure at the present time, and as high as \$2.50 at the mines has been paid, with little of this size offering at that.

Pea size, since the advance in the price of chestnut, has been experimented with by quite a number of householders, and, in some cases, has been found to answer the purpose fairly well. A number of the furnaces in this city are equipped with grates to burn this particular size of coal, and the added number of users has made it a scarce article.

Stove and chestnut, in fact, all sizes, are in splendid demand, and the dealers all report substantial increases over the same period a year ago, when business in this line commenced to grow rather sluggish. The weather for the past week, while not cold, still compels the use of considerable coal.

The wholesale trade still enjoys a full measure of prosperity. Every pound of coal at the present time is going direct to the consumer, and, as an index of conditions, orders for certain sizes are either turned down or taken with the proviso that shipments will be made as promptly as possible, which is practically no promise at all.

Pittsburg

Bituminous—There has been some discussion of the proposition in certain districts that the miners work for 45 days after the expiration of the old wage scale, pending the fixing of a new scale, but

there is not the least likelihood of the necessary unanimity being reached, and it remains probable that there will be a general suspension in the union districts for perhaps 60 days. Nothing has been accomplished toward bridging the difference between the respective demands of the operators and miners.

The local coal market continues strong, with nearly all mines working to as large outputs as the car supply permits, which means about 85 per cent. of capacity in the district as a whole. Prices are firm at the advanced level noted a week ago and may soon score a further advance. We quote: Nut, \$1.10@1.20; mine-run, \$1.15@1.25; 3/4-in., \$1.25@1.35; 1 1/4-in., \$1.40@1.50; slack, 90c.@ \$1 per ton at mine, Pittsburg district.

Connellsville Coke—Prompt furnace coke continues scarce and is bringing practically as high prices as ever. There is practically no demand for furnace coke on contract, the furnaces now in operation being already well covered. Some of the brokers have not been able to catch up in deliveries on contract, and a considerable part of the demand for spot coke comes from them. We note sales of between 50 and 75 cars of prompt furnace coke in the past week, chiefly at \$1.80 and \$1.85, and quote the market unchanged as follows: Prompt furnace, \$1.80@1.90; contract furnace, \$1.80@1.90; prompt foundry, \$2.20@2.30; contract foundry, \$2.20@2.40 per ton at ovens.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Feb. 17, at 393,364 tons, an increase of 39,000 tons, and shipments at 4582 cars to Pittsburg, 6416 cars to points West, and 864 cars to points East, a total of 11,862 cars, an increase of 1300.

Baltimore, Md.

The demand for practically all grades in this market has been exceptionally good, and prices, for the most part, remained firm. The trade is still facing unfavorable car movements on all the railroads; while some of the local operators were able to deliver with less difficulty through the week than heretofore, the majority of the offices reported that they encountered serious delays during the week, and that the car shortage was as bad as when the thermometer was registering around zero.

The prevailing opinion in Baltimore is that a strike in both the bituminous and anthracite fields will take place, and large orders were received during the past week for stocking-up purposes. These consumers, it is stated, will remain in the market until it has been definitely determined just what will be the outcome of the negotiations between the miners and operators.

Buffalo, N. Y.

The coal trade is in an uncertain condition, and promises to remain so for some time. Just now the weather is the chief element; when the thaw of mid-February came on, the consumers, both of anthracite and bituminous, took it for granted there would be no more severe weather and began canceling their orders. When the big blizzard of Feb. 21 appeared, everybody was dumbfounded, both at its severity and its effect on the railroads. It is now said that it will be April, at least, before the roads are in condition to deliver nonperishable freight to all points promptly.

There is some coal getting to destination from the sidings Eastward and prices are actually firmer in Buffalo than they are in the East. Shippers are astonished to find how little the general consumer has become awake to the situation, and the state of distress into which the roads and shippers have been for weeks finds little sympathy at the other end of the line.

It is difficult to quote bituminous, as there is no settled price; the shipper feels that he is entitled to an advance and he is earning it, but the consumer still finds coal at former prices. Quotations must, therefore, remain strong at former figures: \$2.60 for Pittsburg three-quarter; \$2.50 for mine-run and \$2.25 for slack, with Allegheny Valley coal about 25c. less. Coke is fairly strong at \$4.25 for best Connellsville foundry, and \$3.50 for stock.

The anthracite trade is a trifle more hopeful; the demand is not so insistent as it was and it will run down still more as soon as mild weather returns. Shippers have no surplus and do not expect any right away. The Western situation is reported a little easier, especially as the last cold spell did not strike that section as severely as it did the East.

Cleveland, Ohio

Conditions in the past week have been rather serious on account of car shortage, and while there has not been any actual suffering on account of the scarcity, nevertheless there has been quite an uneasiness because of the small amount moved from the mines. The railroads have been unable to deliver the heavy tonnages moving into the West and North during the past six weeks because of the snow blockade; as a result of the large number of loaded cars laid out on sidings the roads are short of equipment and cannot furnish empties to the mines. We are assured, however, by the railroads that now that the severe weather has abated the empties will be returned promptly and the mines will be supplied next week.

Prices have advanced on all grades of coal in the past week from 15 to 25c.

per ton in this market. It is not expected, however, that these prices will remain after an adequate car supply has been furnished.

Columbus, Ohio

Just at the time when railroads were beginning to relieve the congestion of traffic incidental to the extreme cold weather of the months of January and February, another storm appeared and again demoralized traffic on all of the roads. As a consequence the condition is even worse than it has been at any previous time during the winter, and there is little hope for an immediate remedy unless more favorable weather appears.

Prices are still ruling firm, and there is a premium on all grades and varieties. Many manufacturing establishments had to close down temporarily to permit of the coal supply being used for heating purposes. Some suffering was reported in certain localities, but this was not widespread nor severe.

Operations in Ohio mining districts have been restricted to about 50 to 60 per cent. of the average. The chief hindrance has been the inability to secure sufficient cars. Motive power is lacking on the railroads and the general condition of traffic is demoralized to the extreme.

Retail trade has been active because of the low temperatures which have been prevailing. Consumers were compelled to place additional orders, and the ice on the streets made deliveries rather difficult. Prices in retail circles rule firm and higher.

Prices prevailing in Ohio are as follows:

<i>Hocking Valley</i>	
Domestic lump.....	\$1.60
3-in.....	1.40
Mine-run.....	1.15
Nut.....	1.15
Nut, pea and slack.....	0.80
Coarse slack.....	0.70

<i>Pittsburgh No. 8</i>	
3-in.....	1.30
Mine run.....	1.10
Coarse slack.....	0.80

<i>Pomeroy Bend</i>	
Domestic lump.....	1.75
3-in.....	1.50
Mine-run.....	1.20

<i>Kanaucha</i>	
Domestic lump.....	1.40
3-in.....	1.25
Mine-run.....	1.05

Cincinnati, Ohio

Conditions are little changed from what they were a week or ten days ago. There has probably been a lessening of the pressure on traffic officials, owing to the gradual clearing up of congestion at the various terminal points on most railroads in this territory. For this reason also, the wholesale offices feel the tendency is in the right direction, so far as pressure on them is concerned for delivery of orders long overdue. They have in no way been responsible for the delay, although the buyer is inclined to consider them so.

The demand for the various grades of fuel is practically unchanged, either relatively or as a total. Fine coals are strongest, with some grades nearly impossible to get. As soon as the railroads are on something like a normal basis again, as regards deliveries, it is probable there will be a big drop in the orders in wholesale offices. Many orders now on hand are doubtless duplicated in more than one office by the purchaser. When he has enough in his bins, regardless of whom purchased, he will stop shipments by canceling other orders, which he can readily do on the ground that delivery was too long delayed, and the delays have been such within the last 60 days that no seller could deny them.

Thurmond, W. Va.

The cold snap of January, which was hailed as a sure promise of better prices and increased output, has caused the worst congestion of movement on the western railroads connecting with the Chesapeake & Ohio and the Norfolk & Western that they have ever seen, while at the same time the demands for coal have been largely increased, both on contracts and for spot shipments. Owing to the large number of cars tied up, more particularly in the Toledo district, where there are about 14,000 loads, the supply of empty cars is so small that the mines here are working only about two and one-half days per week. Some of the Middle West railroads are stocking up, in anticipation of a strike, the Pennsylvania Lines having placed orders for 60 cars daily, and this is tending to add further complications.

A price of \$1.25 per net ton, f.o.b. mines, is being quoted on all spot coal, and sales at \$2.85 per gross ton, f.o.b. Hampton Roads, have been made.

The Chesapeake & Ohio and Norfolk & Western are moving such coal as is loaded to tidewater in good time and returning empties quickly, but the Virginian Ry. has fallen down completely, owing to a strike at its shops and the shortage and bad condition of its motive power.

Charleston, W. Va.

Market conditions have undergone no change in West Virginia during the past week, but a drop in prices is anticipated by some coal men if the mild weather continues much longer. The indications in the earlier part of the week were that the car supply would be good for the present week, a condition that has not existed since the first of the year; but it is too early to say that there has been a material change or improvement as yet.

Louisville, Ky.

Normal conditions are again prevailing in the local coal trade. The breaking up of the ice in the rivers, and the action

of the railroad companies in relieving the congestion have brought about this condition, together with the letup in the heavy demand for coal. While business still continues brisk, both in the retail and the wholesale lines, everything is moving along smoothly. The difficulty which the commercial institutions were experiencing in securing enough fuel to keep steam plants going has been remedied, and manufacturers and office tenants have ceased to complain.

Memphis, Tenn.

The weather conditions in this territory have materially changed since our last issue, the temperature going up to as high as 60° the last few days. This has caused a surplus of domestic coal to accumulate in the city.

The wholesale end for steam coal has continued stiff and we have experienced some difficulty in being able to get a supply sufficient to take care of our steam contracts. The mines have held firm on their advanced price, and shown their wisdom in this matter, as their work has been limited only by the car supply.

West Kentucky prices are as follows:

No. 1 lump.....	\$1.50@1.75
No. 2 lump.....	1.15@1.35
Nut.....	1.10@1.25
Mine-run.....	0.85@1.00

The demand for screenings has been something unusual the entire season, it being impossible to secure enough fine coal at any time to take care of contracts.

The Cahaba and Jellico fields are all crowded with orders, and prices range: Jellico, \$2@2.50; Cahaba, \$2.75@3.25.

Nashville, Tenn.

Prices are not quite as stiff as they were, but the demand for coal is good, and car service is, if anything, worse than it has been. This, in a measure, has kept prices as high as they are.

Quite a few inquiries have been made for foreign shipments after Apr. 1, but hardly anything before that period. There seems to be quite a difference of opinion in regard to the strike on that date, although many people who claim to be fairly well in touch with the situation contend that there will be none. The demand for screenings, though probably not as strong as heretofore, is still fairly good.

The prevailing prices in the West Kentucky field are as follows:

Lump.....	\$1.35
Nut.....	80.95@1.05
Screenings.....	0.30@0.40
Mine-run.....	0.90@1.00

Chicago

There is an upward trend in Chicago coal prices, which dropped from 25 to 35c. per ton last Monday and Tuesday, but re-

covered from the loss with a bound on Wednesday.

One of the chief features of the market has been storage-coal buying. The Burlington road took 4000 cars of Eastern coal, paying \$1.10@1.20 for ¾-in., with the average price ranging in the vicinity of \$1.15. Smokeless coal is firm at \$1.25 at the mine for mine-run, with lump and egg hard at \$2@2.25. Anthracite shipments have been just as heavy as the productive capacity of the mines and the carrying capacity of the railroads would permit.

Prevailing prices at Chicago are as follows:

<i>Sullivan County:</i>	
Domestic lump.....	\$2.62
Egg.....	2.62
Steam lump.....	\$2.37@2.57
Screenings.....	1.97@2.07

<i>Springfield:</i>	
Domestic lump.....	\$3.05
Steam lump.....	\$2.32@2.42
Mine-run.....	2.12@2.22
Screenings.....	1.82@1.97

<i>Clinton:</i>	
Domestic lump.....	\$2.57
Steam lump.....	\$2.22@2.32
Mine-run.....	2.17@2.27
Screenings.....	1.87@2.00

<i>Pocahontas and New River:</i>	
Mine-run.....	\$3.25@3.55
Lump and egg.....	4.20@4.30

Coke—Prices asked for coke are: Connellsville and Wise County, \$4.65@4.75; byproduct, egg and stove, \$4.95; byproduct nut, \$4.75; gas house, \$4.90 @ 5.

Indianapolis

A week or more of moderate weather previous to the snow storm has not lessened the demand for coal at Indiana mines, practically all of which are operating full time. Most of the present output is for storage. The dealers have in their yards almost enough for their trade until Apr. 1, when a suspension is looked for.

The result of this wage scale controversy is a demand for coal at higher prices through February and March by the consumers who want it for storage. The sale of such coal nets the operator a far better profit than if an agreement had been reached on a wage Feb. 1.

Minneapolis—St. Paul

The coal business in the Twin Cities has taken a decided slump during the past 10 days as the mild spring weather has affected the wholesaler and retailer alike. Many orders which were placed with the wholesalers during the latter part of December and in January are reaching destination and this condition, together with the mild weather, has put a damper on the dock and all-rail business. Except for the fact that the wholesalers still have on their books a considerable number of unfilled orders they would be doing practically nothing.

The strike proposition does not seem to scare the smaller manufacturer or steam user much, but undoubtedly they will be in the market during next month and will want enough coal to carry them over for 30 or 60 days. Owing to the demand of the large manufacturing plants for coal in 100-ton lots at the mines, and on account of the poor demand here, prices have taken a decided drop.

St. Louis, Mo.

Market conditions are practically unchanged, and indications are that there will be no radical change until perhaps after Mar. 5. There has been a marked increase in the amount of railroad tonnage placed during the past week, while at several points on the Illinois Central the entire outputs of the mines are being stored on the ground adjacent to the mine, and this is giving work on an average of five days a week to the miners.

Storage coal for commercial purposes is not as much in demand as it was two weeks ago. As a matter of fact, some of the large buyers are hesitating before placing orders, expecting there will be a surplus tonnage on the market the latter part of March if the weather gets warm. There is little storage demand from the country, and indications are that the last week in March will witness a heavy demand by those who are taking a long chance and waiting for the market to break.

The prevailing prices, which are very uncertain, as they change from day to day, are about as follows:

Franklin County

Lump and egg.....	\$1.85@2.00
No. 1 nut.....	1.75@1.85
No. 2 nut.....	1.60@1.70
No. 3 nut.....	1.35@1.50
2-in. screenings.....	1.00@1.10

Cartersville

Lump and egg.....	\$1.65@1.75
No. 1 nut.....	1.50@1.60
No. 2 nut.....	1.35@1.45
No. 3 nut.....	1.15@1.25
Screenings.....	1.00@1.10
Mine-run.....	1.25@1.35
No. 1 washed.....	1.80@1.90
No. 2 washed.....	1.50@1.60
No. 3 washed.....	1.25@1.35

Spokane, Wash.

The coal situation in Spokane remains quiet, few sales either more or less than usual being made. The spring appears to be here, and warm weather is prevailing. No change has been noted in the prices of standard coals since last November. Local yards have a good supply on hand, and are receiving small shipments from the mines every week.

Salt Lake City, Utah

During the past week there has been an increased demand for coal, owing to the recurrence of winter weather. Beginning with March it is reported that the price of Wyoming coal in the Salt

Lake market will be reduced to the same level as the Utah product. For the past two years it has been slightly higher. It is not known whether the reduction will be made in the freight rate or in the price of coal at the mine.

The prices of Utah coal follow: Lump, \$2.40; nut, \$2.15; slack, \$1.25.

Portland, Ore.

There is no change in the situation here, the demand for coal continuing light on account of the mild weather. This has been a dull season for the fuel dealer, the only cold spell occurring early in January and being of short duration. As a consequence, not only coal dealers, but wood dealers as well have had rather poor business here during the winter months.

Production and Transportation Statistics

THE VIRGINIAN RY.

Total shipments of coal over the Virginian Ry. for January were 316,766 short tons as compared with 258,869 for the month previous. Strikes now in effect on this road are seriously crippling the service.

THE CAR SITUATION

In the two weeks ended Feb. 14, the surplus of coal cars decreased from 14,042 to 11,464, and the box car surplus decreased from 12,781 to 11,426. Miscellaneous car surplus showed little change, and the flat car surplus was slightly smaller.

Foreign Markets

SWEDEN

Concerning the effect the possible strike of the British coal miners on the situation in Sweden, the *Daily Consular and Trade Reports* says:

It is conceivable that the labor troubles in England might affect the situation to an extent such that Sweden would have to look elsewhere for its supply, thus giving a possible opportunity for the introduction of American coal.

Coal constitutes nearly 10 per cent. of the total imports into Sweden. About one-fifth of this fuel is entered at Gothenburg, which port and Stockholm are the principal import places. Malmo and Gefle coming next. The total import for the last three years for which figures are available has been, in tons: In 1907, 4,146,785; in 1908, 4,427,507; in 1909, 4,084,055. It was practically all from Great Britain.

The production of coal in Sweden is less than 7 per cent. of the consumption of the country, the output in 1910 being 302,800 tons. [A list of Gothenburg coal importers may be obtained from the Bureau of Manufactures.]

GREAT BRITAIN

Business in the British markets is being conducted within restricted limits due to the uncertainty in the labor situation.

The prices at which purchases can be made are governed, not so much by the relative value of the different grades, as by the condition of the consumer.

Approximate quotations are as follows:

Best admiralty, large.....	\$1.56
Second admiralty, large.....	4.20
Best dry, large.....	4.32
Second dry, large.....	4.08
Black veins, Cardiff shipment.....	4.26
Western valleys, Cardiff shipment.....	4.20
Eastern valleys, Cardiff shipment.....	3.96

Financial Notes

The net income from the operations of the Delaware, Lackawanna & Western coal department for the year 1911 was \$3,490,085, or \$108,822 more than for 1910. Expenditures during the year on coal properties aggregate \$747,265. Cost per ton of mining was about 2c. more, due to the necessity of working thinner seams.

Total earnings of the Byproducts Coke Co. for 1911 were \$479,746. Deducting depreciation accounts and dividends the total undivided earnings Dec. 31, 1911, were \$169,051. From these earnings a dividend of \$3 a share, amounting to \$90,000, was declared, payable Feb. 15, 1912, and a bonus given the employees of \$6942.

The newly organized Brier Hill Steel Co. of Youngstown, Ohio, has some valuable properties. Included among these are blast furnaces, rolling mills, ore properties and a good vein of coking coal. The blast furnaces, coke and ore properties are valued at \$6,652,000 and the mill properties at \$1,860,000. The total resources of the company are given at \$15,000,000, with a cash and inventories account of \$1,051,000.

It was announced in Denver on Feb. 16 that negotiations pending for several months had been concluded for the readjustment of the finances of the Denver, Laramie & Northwestern R.R. and its allies, the Denver-Laramie Land & Iron Co. and the Colorado-Wyoming Coal Co. The plan calls for a reduction in the total debt (funded and floating) to not over \$1,000,000 through a reduction in the floating indebtedness by \$1,000,000.

Stock of the Lehigh Valley Coal Sales Co., which sold recently at 192, advanced to 207 on the Curb. This is the stock representing the coal-mining properties segregated by the Lehigh Valley R.R. Co. Within two weeks the price has been down to 180. The Lehigh is almost as strong in the coal business as the Lackawanna, and stockholders are making comparisons between Lackawanna Coal at 350 and Lehigh Coal at 207, as showing the bargain possibilities in the latter.

Earnings of the Colorado Fuel & Iron Co. are running very much at the rate of last year, which showed a surplus of \$1,260,000 after all deductions. Colorado Fuel preferred is selling around 115, with more than customary activity of late. By the time the company's charter expires, which will be on Oct. 21 of the present year, the accumulated unpaid back dividends will total about \$1,330,000, or 64 per cent. of the entire par value of \$2,000,000 preferred stock outstanding. Just what sort of a deal the preferred shareholders will get when the time comes for renewing the charter it is difficult to say. In fact, the matter of whether the company's charter will be renewed or the company reincorporated has not been settled.

West Virginia Statistics for 1911

By John Laing*

Excerpts from advance sheets of the chief mine inspector's report for the fiscal year ending June 30, 1911. The encroachment of the byproduct oven into the coke industry is responsible for a falling off in this branch. Total coal production for the period was 54,033,186 gross tons, a gain of 2.09 per cent. Tables giving complete statistics will be published in a later issue.

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Briefly stated, the mines of West Virginia reported for the year ended June 30, 1911, a total output of 53,733,186 gross tons of coal, and to this amount we have added 300,000 gross tons to cover the various small operations throughout the state, which are not required to report to this department; this makes a grand total of 54,033,186 gross tons of coal produced at all the mines in the state. This is an increase of 1,109,478 gross tons over that for the year previous, or a gain of 2.09 per cent.

It is gratifying for this department to be able to report an increased production in coal, taking into consideration the condition of the markets and business in general throughout the country during the past year. I believe that, if general business conditions continue normal during the present year, our production will far exceed last year's output and each year will continue to exceed the previous one until within the next seven or eight years we will be the leading bituminous coal-producing state in the Union. We are now the second largest producer, Pennsylvania being first.

The total value of the coal produced (54,033,186 gross tons) at the mines, was \$52,952,522.28. The value of the coal loaded on railroad cars and shipped from the mines was \$46,870,788.30, practically all of which was consumed in other states, which means that the coal industry brought this amount of money into the state of West Virginia.

On account of market conditions, we had a reduction in the coke production, it being this year 2,694,047 net tons, as compared with 4,217,381 last year, or a decrease of 1,523,334 net tons. Manufacturing of coke at the mines in this state is gradually being discontinued, as the various byproduct plants throughout the country can manufacture coke, even after shipping the coal from the mines to their plants, much cheaper than it can be produced at the mines; therefore, as above stated, coke burning at the mines is gradually being dispensed with. This, however, in no way interferes with the production, as the West Virginia coals are much in demand at the byproduct plants, owing to their superior quality for coking purposes.

The coke at the ovens this year was valued at \$5,037,867.89. Practically all of this was consumed in other states, which means that the coke industry brought this amount of money into West Virginia during the year.

ACCIDENTS

We regret that there was an increase of 12 fatal accidents this year as compared with last, the total this year being 332. The increase is due to two serious

accidents, one being the explosion of the Ott No. 20 mine, operated by the Davis Coal & Coke Co., Apr. 24, 1911, in which 23 men lost their lives; and on Dec. 31, 1910, there were 10 men killed in a run-away on an incline at the Lick Branch Mine, operated by the Red Jacket Coal & Coke Co., making a total of 33 men being killed. This shows conclusively that accidents from general causes, such as falls of roof, mine cars, etc., were not so great this year as last, which indicates that extra precaution has been taken by the operators, managers, superintendents, and foremen, notwithstanding the fact that more coal was produced. All of these accidents occurred at 223 mines, employing 28,533 persons and producing 26,966,844 gross tons of coal, while at the remaining mines there were produced 27,066,342 gross tons of coal, without the loss of a single life.

There were 179,710 tons of coal produced per each fatality, and a total of 819 nonfatal accidents, which is a decrease of 123, as compared with last year.

Quite a number of improvements have been made at the various mines on old plants, as well as opening up and re-equipping new mines. During the year there were 21 new mines opened which have just begun shipping and which will materially add to the production for the coming year.

MEN EMPLOYED AND LABOR TROUBLES

There was an average of 70,644 persons employed in and around the mines during the year, including 2868 coke workers. This does not include the mine superintendents, managers, foremen, fire bosses, store and office help for whom it would be safe to add 2350 persons, which would make a total of 72,994 directly connected with the operations of the mines in this state.

Included in this total of 70,644 there were 30,044 white Americans and 11,950

negroes, the balance being composed of Italians, Hungarians and other foreigners, who do not speak the English language.

We are pleased to report that the production in this state has not been held down on account of strikes, as there have only been eight of these throughout the entire state during the year. These affected six different mines, but were only local in each case and were amicably settled within a few hours after they occurred.

EXAMINATIONS

Since the inauguration of the system of examining applicants for certificates to act as mine foremen and fire bosses, up to the close of the report for the year ending June 30, 1911, we have examined 2203 persons, 1243 of whom were successful, as follows: 627 first-class certificates; 566 second-class certificates; 50 fireboss certificates.

We believe that these examinations have done much good for many reasons. It has put the men holding these positions to thinking and studying mining conditions, which better qualifies them to act in these very responsible positions. As time goes on, we will, no doubt, have the advantage of a gradual improvement in the efficiency of men in such positions. The younger men, who are now working in and around the mines and who are aspiring eventually for such places, will educate themselves more thoroughly, knowing that when the time arrives and a vacancy presents itself, they must be in a position then to pass the examination; they will not then be permitted to accept the foremanship of a mine and then be taught the duties which they will have to perform, but will be prepared from the beginning, and when they are given such positions their advancement to still higher ones will come more rapidly. The men engaged in mining realize that the time has come when persons in charge of the lives of the men in and around the mines have got to be men of efficiency as well as of good moral character.

According to Edward W. Parker, of the United States Geological Survey, West Virginia possesses a larger supply of coking and other high-grade coal than any other state in the Union, except Pennsylvania. In 1910, West Virginia produced 3,803,881 short tons of coke valued at \$7,355,233. Alabama produced 3,249,027 short tons valued at \$9,165,821. In quality, the West Virginia coke is better than that of Alabama, but the average price of Alabama coke in 1910 was \$2.82, while that of West Virginia was \$1.93.